

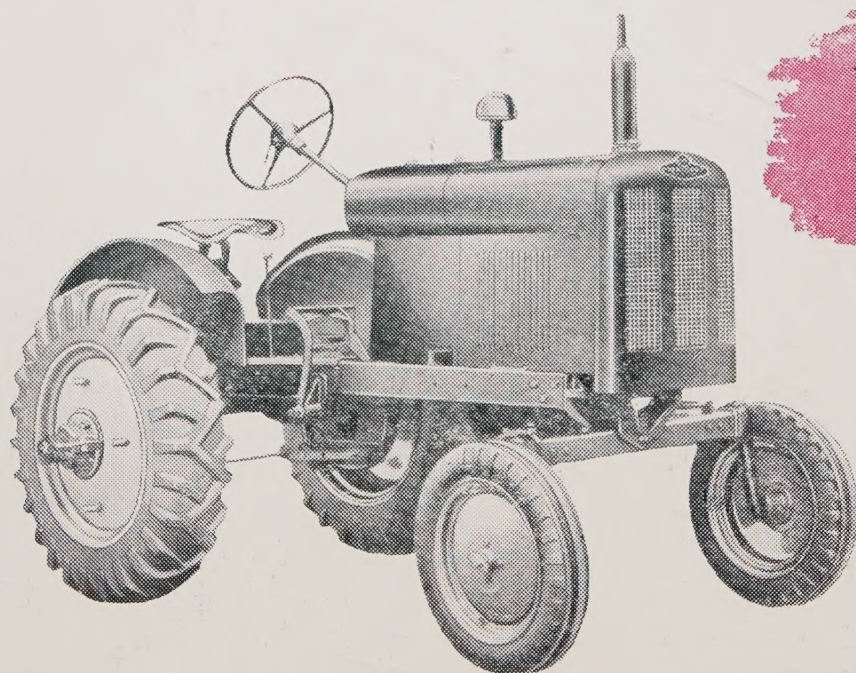
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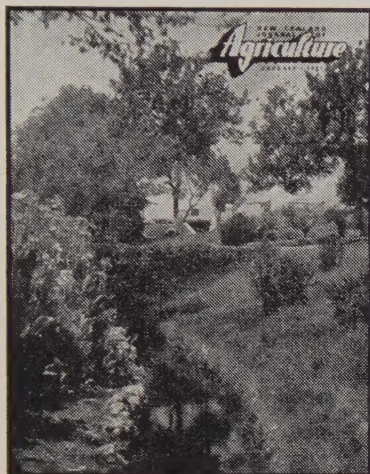
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This Month's Cover



New Zealanders' love of the outdoors and a countryside that is rich in beauty and interests have combined to make touring by motor-car one of the most popular ways of spending holidays. When the numbers of touring holiday-makers first reached sizable proportions local bodies and individuals recognised the need for providing accommodation, and today even small centres have well-appointed camps to cope with what has become in summer an influx of visitors. This month's cover, which is reproduced from a colour photograph by Atkinson and Finney, shows a family at the Hastings motor camp.

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WHAKATANE IN AUCKLAND



Whakatane, a river-mouth port on the Bay of Plenty, handles more than 20,000 tons of fertilisers and general merchandise which are brought in annually by coastal vessels, and more than 5000 tons of butter and 1100 tons of cheese are shipped out in the same period. Dairying is the main type of farming carried on in the district, with the fattening of store sheep and cattle and the production of fat lambs and wool of less importance. The milling of indigenous and exotic timbers is a major industry, up to 50 cords of pine logs being used daily at the local board mills.

PROGRESS IN PLANT QUARANTINE SERVICES



IN many fields of agriculture co-operation between nations is destined to contribute increasingly toward feeding the hungry peoples of the world by preserving the productivity of land which gives generously—as does that of New Zealand—and persuading undeveloped soils to yield the where-withal for clothing and food. One

little-considered aspect on which such co-operation is being brought to bear, and which could have a vital effect on New Zealand's economy, is plant quarantine.

This subject has come to be considered of such moment that the whole question is being considered by the Food and Agriculture Organization of the United Nations, of which New Zealand is a member. The ever-increasing velocity of transport, particularly by air, has so reduced the travelling time of cargo that the hazard of introducing serious pests and diseases has been brought much closer, even to countries favoured by their geographic isolation, as is New Zealand.

FAO has taken the first step toward co-ordination by publishing a "Digest of Plant Quarantine Regulations" and proposes to go much further by drafting an International Plant Protection Convention at its 1951 conference. Now the formation of regional authorities is proposed, and New Zealand will be represented at a conference to be held in Suva, Fiji, on March 28 to discuss the co-ordination of plant quarantine procedure and facilities in the countries of the South Pacific.

The Government has under way one helpful advance toward international co-operation in this sphere. As a result of our joint representations with the Australian Government the United States authorities have agreed that aircraft flying south from Hawaii shall receive the same pre-flight inspection and disinfecting as planes travelling east to the mainland of the United States, and an agreement to that effect is expected to be signed in the near future. That will be a big advance on the routine point-of-origin inspection, as it means that every aircraft leaving Hawaii for New Zealand, and its contents, will be inspected and treated before it takes off.

The steps the Government has taken in the external field should show that it realises the importance of an efficient plant quarantine service to New Zealand, for without such a service our horticulture, and indeed other branches of our agriculture, are left open to the ravages of pests and diseases which could well wreck our economy. In addition our internal quarantine facilities are being overhauled, and measures will be taken to ensure that the service is as efficient and up-to-date as possible.

Revision of Regulations

The Horticulture Division of the Department of Agriculture is responsible for the administration of plant quarantine under Regulations governing the importation of fruit and plants into New Zealand which were first gazetted in 1915. Since then, apart from a number of Amendments, the Regulations have not been revised. The need for a complete overhaul of the Regulations has long since been apparent, so a meeting of representatives of all the horticultural organisations interested in the subject was held in November and proposed revised Regulations were tabled. I desire that these be studied closely and discussed by the organisations and that their views be forwarded to me before the end of March.

While the Regulations are being revised atmospheric fumigation vaults at Auckland, Christchurch, and Dunedin have been converted to the use of a more efficient fumigant. Small vacuum fumigation cylinders for use at overseas airways terminals and for fumigating parcels received through post offices have been installed at Auckland, Wellington, Christchurch, and Dunedin. In addition the erection of new buildings in Auckland and Wellington to house large, modern vacuum fumigation plants of 1000 cub. ft. capacity capable of quick and efficient fumigation and the erection of a new atmospheric fumigation vault in Christchurch have been authorised.

The Government has authorised the setting up of a Plant Quarantine Section of the Horticulture Division, and Plant Quarantine Officers will have the duty of meeting all aircraft and ships arriving from other countries and of operating vacuum fumigation facilities.

I am sure that all thinking people will realise that the aim of providing these very reasonable safeguards is not to restrict but to facilitate trade in horticultural products. Some commodities the entry of which might have had to be prohibited will in the future be available to the people of New Zealand through the provision of such facilities.

For example, the importation of grapes from countries where the Mediterranean fruit fly was known to exist was prohibited for fear of introducing it into this country. Now, however, it has been shown that all stages of the fly can be killed at certain low temperatures. That means that the people of New Zealand will be able to have grapes from South Africa at a time of year when locally grown grapes are off the market, provided that they receive the proper temperature treatment before arrival.

K. J. HOLYOAKE, Minister of Agriculture.

CARE OF LIVESTOCK DURING FEBRUARY

Contributed by the Animal Research Division.

If the ewes have been held on short pasture since weaning, they should now be in good, hard condition. About 14 days before tupping they should be crutched and given the best pasture available. This will ensure that at the time of mating they are rising in condition, which is one of the most important factors in providing a good lambing percentage. Rams, too, should be crutched and flushed for about 3 weeks before tupping. They should be dipped before this flushing period, as dipping too close to tupping appears to reduce ram fertility.

PREPARATIONS FOR TUPPING

* * *

Bush sickness can be completely prevented by topdressing annually with 1cwt. of cobaltised superphosphate per acre, and in the North Island at least this is best applied in the usual autumn topdressing. This rate supplies adequate cobalt, and if more superphosphate is used, the additional amount need not be cobaltised. For fuller details consult the Department of Agriculture's Bulletin No. 180, which is obtainable free at the nearest office of the Department.

COBALT DEFICIENCY

* * *

Scouring in cattle and staggering in lambs grazing on peat land can be prevented by topdressing the pastures in autumn with 5lb. of bluestone per acre. Copperised superphosphate is now available or the bluestone may be mixed with lime. For fuller particulars the Department's Bulletin No. 238 should be consulted.

COPPER DEFICIENCY

* * *

If warm rains fall in February after a spell of hot, dry weather, facial eczema is likely to occur in districts which are usually affected. Experience in 1948 showed conclusively that the disease can be prevented by shutting sheep up at the rate of at least 100 to the acre as soon as the rains fall, and keeping them so confined until the weather becomes either hot and dry or much cooler and the pasture visibly hardens. If dry periods occur, plans should be made for action along these lines: Provision of good hay at the rate of 2lb. per sheep per day, which will prevent loss of condition. If crops of rape, kale, turnips, or chou moellier are available, they can safely be grazed during the dangerous period. Lucerne has not proved safe, possibly because of ryegrass which is frequently present as a weed.

FACIAL ECZEMA

* * *

Preparations should now be made for the autumn hatch by blood testing the flock for pul-
lorum disease and by cleaning and fumigating the
incubators. A vacuum cleaner is ideal for clean-
ing, and advice on fumi-
gation may be obtained from the local Poultry
Instructor.

PULLORUM DISEASE IN POULTRY

* * *

Autumn is a critical period for calves. Deaths during winter can be eliminated by rotating the calves through the paddocks ahead of the cows at intervals of 3 or 4 days. If this is not being done, it should be started immediately. Calves treated in such a way will be up to 100lb. heavier as yearlings than those kept confined in a calf paddock. If calves are unthrifty and scouring, it may be necessary to give 2 or 3 doses of phenothiazine at 3-weekly intervals, but this is seldom necessary with calves which are rotationally grazed.

CARE OF CALVES

* * *

If several cows return to the bull at long, irregular intervals and some abort early in pregnancy (2 to 3 months), trichomoniasis may be the cause, and veterinary advice should be sought. There are many different reasons, apart from trichomoniasis, for cows failing to get in calf at the desired time. Any one cause or a combination of causes can result in herd infertility which may be impossible to correct during the short mating period. A diagnosis now will help in preventing similar trouble next season.

COWS RETURNING TO THE BULL

* * *

Sows which are to be remated should receive 6 gallons of milk per day for the first month after the litters are weaned. This will greatly facilitate getting them in pig. Weaners should be fed up to 1lb. of meal per day, as fast growth in the earlier stages means heavier pigs when the milk supply fails. Pens showing deterioration of pasture should be harrowed and surface sown or ploughed in preparation for a crop.

SOWS AND WEANERS

* * *

Serious lameness in cattle can be caused by their eating hay heavily infested with ergot. Such hay can be easily recognised from the presence of the black ergots which replace the seeds of ryegrass and other grasses. Where ergot is known to occur hay should be made before the grasses have time to seed.

ERGOTISED GRASS MAKES DANGEROUS HAY

Fattening Weaned and Store Lambs

THE management of lambs at weaning and the use of crops for the fattening of weaned and store lambs in New Zealand are discussed in this article by M. C. Armstrong, Veterinarian, Department of Agriculture, Timaru. Common diseases of lambs fattening after weaning are described and useful information is given on their control.

THOUGH farmers everywhere are anxious to fatten an ever-increasing percentage of lambs on their mothers, a large percentage of lambs in many areas of the North Island and most areas of the South Island still must be fattened on special crops and pastures after being weaned.

Best Time for Weaning

When crops of rape, kale, turnips, or lupins are to be used for fattening weaned lambs the time of weaning is determined to some extent by the state of readiness of the fattening crop or the specially spelled pasture. Rape should have reached a suitable state of maturity, and kale, turnips, or lupins should have made a satisfactory bulk of growth.

Lambs are very restless for a few days after being weaned, and considerable trampling damage can be done to crops if lambs are weaned directly on to them. Therefore it is advisable to allow the lambs a few days on the best spelled pasture available to let them settle down. About mid-December a pasture which is rich in clovers, especially red clover, should be spelled. Such a pasture gives the lambs a chance to settle down after being weaned, and equally important is the chance it gives them to start thriving again before going on to the fattening crop. They should then be drenched against parasites with phenothiazine and placed on the fattening crop.

Drenching at Weaning Time

Because lambs at weaning age are very susceptible to internal parasites, especially the stomach worms, severe infestations may develop after weaning them on crops or pastures if unexpected wet conditions eventuate. Therefore it is a wise precaution to drench weaned lambs, with phenothiazine for preference, and to do it 24 hours before the mob is shifted on to the fattening crop. Lambs to be fattened on specially spelled pastures should also be drenched against internal parasites 24 hours before going on to such spelled pastures.

Bought store lambs to be fattened on crops should be dipped and placed for a few days on pasture aftermaths or stubble to allow them to settle down. They should be drenched for parasites 24 hours before they go on to the fattening paddocks.



Lambs feeding on chou moellier and swedes. Chou moellier is more resistant to club root and insect pests than rape or turnips.

Fattening crops, pasture aftermaths, and pastures which have been spelled for a month or more are practically free from the infective larvae of sheep parasites, and the management of lambs should be aimed at keeping them free. Even those lambs which are in the best condition at weaning time and the best lines of bought-in stores will be carrying some parasites. These parasites may increase rapidly under conditions of high carrying capacity combined with periods of dull, moist weather if drenching with phenothiazine is not practised before using the fattening feeds. There is a reason why it is advisable to drench the lambs and then hold them on the pasture for 24 hours before putting them on to the fattening crops or spelled pastures; it is because phenothiazine takes 24 hours to pass through the alimentary canal of sheep and exert its sterilising effect on worm eggs about to be passed, often in huge numbers, in the faeces. If the lambs are drenched about weaning time or after purchase as stores, no additional drenching should be required if reasonably dry summer-to-autumn conditions follow. However, drenching late-fattening lambs usually is advisable about 3 weeks after the start of wetter autumn conditions, which are likely to favour the multiplication of pathogenic parasites.

Fattening on Rape

In the medium- to light-rainfall districts of New Zealand many more lambs are fattened on rape than on any other crop. Rape grows well on a wide variety of soil types and it can be conveniently followed by wheat or new grass in a rotation. When sown in October or early November rape can usually be ready in January. Farmers are advised to consult their nearest Instructor in Agriculture for local recommendations on varieties, times of sowing, and fertilisers.

As it must be mature before feeding is begun, rape does not show to best advantage in cold, foothill areas or in heavy-rainfall districts, where it may fail to mature satisfactorily. There is some uncertainty with rape because of its susceptibility to insect pests and fungous diseases, especially in dry seasons. The incidence of club root may be reduced through the use of the recently selected Club Root Resistant variety.

Matured rape provides a complete diet rich in digestible protein. Experiments have shown that a maximum speed of fattening can be attained on rape alone without any additional supplement in the form of hay or grass run-off.

Experiments on rape fattening of lambs conducted at the Kirwee Experimental Farm (recorded in the "Journal" for November, 1946) indicated the following conclusions:—

Vitamin- or mineral-lick additions are unnecessary, provided there is no confirmed cobalt deficiency.



[Green and Hahn Ltd. photo.]

Lambs on rape. Experiments have shown that a maximum speed of fattening can be attained on rape alone.

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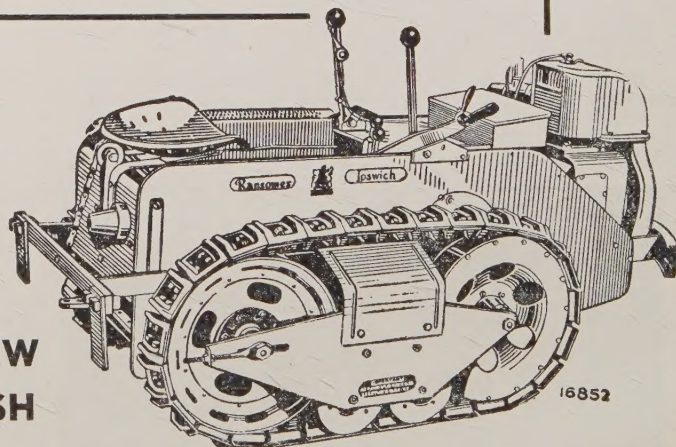
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FATTENING WEANED AND STORE LAMBS

Grain supplements or the provision of hay for lambs on rape do not hasten the speed of fattening and give no advantage over rape alone.

Lambs fatten fastest and best if fed on rape night and day with no run-off to pasture.

As a result of the plant selection and certification of seed undertaken by the Department of Agriculture two main types of rape are in common use at present, Broad Leaf Essex and Giant, Broad Leaf Essex being the more common. It grows to medium height, matures earlier and more readily, and provides a good second growth for flushing ewes later in the autumn. Giant rape is a later-maturing type which on heavy soils tends to grow too tall for the best results. It is a popular variety for the lighter lands and also for following the first sowings of Broad Leaf Essex on better soils. It usually produces a greater initial bulk of feed of a little better feeding value, but it does not produce a second growth to compare with that of Broad Leaf Essex. The Club Root Resistant variety should be used on farms where club root is likely to occur.

When lambs are placed on rape before it is mature they are very likely to scour or they may suffer from rape scald. The stage of maturity of the rape at which feeding off can be started to best advantage is when the leaves have turned purple on the edges. In an average season rape is usually mature 8 to 10 weeks after being sown. Though immature green rape should not be fed, disappointing results may be obtained from rape which is too mature and fibrous. For this reason rape can be used to greatest advantage when sown in breaks at fortnightly intervals. Rape is in its most suitable digestible form during the 4 weeks after it matures.

Smaller Breaks for Parasite Control

For the greatest benefit to the animals rape should be fed in breaks of such a size that they can be eaten out in 7 days. It is known that the eggs of stomach worms passed out in the dung take about 8 days to develop into infective larvae and be ready to reinfest sheep. Shifting the mob on to fresh breaks at 7-day intervals breaks the life cycle of the harmful internal parasites which become troublesome after unexpected moist weather. The lambs should not be allowed to run back over the recently eaten break after being put on a new break; otherwise reinfestation may build up during "wormy" weather. Under average Canterbury conditions of rape growth about 700 lambs would eat out a 7-acre break of rape in 7 days. In periods of "wormy" weather the principle of management should be the utilising of smaller breaks, with the shifting of the mob forward more frequently. It is estimated that a normal crop of rape should fatten 25 lambs per acre in about 5 weeks, though these numbers vary with the condition and age of the lambs when placed on the crop.

During recent years the scarcity of wire netting has prevented much subdivision of rape paddocks, and the decision whether to feed in subdivisions or not depends on consideration of the supply of labour and wire netting in relation to past experience



Established stands of lucerne are valuable for fattening lambs in time of drought.

with rape wastage and parasitic disease of the lambs on the farm. Feeding the crops in breaks conserves the feed and avoids the waste and damage associated with extensive grazing.

During dry, hot periods lambs on rape will benefit if some provision can be made for drinking water. An investigation at Canterbury Agricultural College, Lincoln, indicated that lambs on mature rape fattened well when given free access to artesian water. The water was taken only when it was required during hot, sunny weather. From the general experiences of farmers it appears that the provision of water is not essential when rape is fed in breaks in average climates. If lambs become restless on rape in hot, dry weather, lack of water may be the first factor requiring attention.

Feeding rape to lambs during wet spells is not advisable. Lambs should be shifted off rape during continuous wet weather to avoid the setback of scouring disorders. During moist periods it has been found an advantage to supplement rape with hay or chaff.

Rape Scald

Lambs occasionally may suffer from rape scald, an acute inflammation of the skin tissues of the head; this may also occur on the backs of lambs, particularly those which have been shorn. The lesion is typical of a sunburn or photosensitisation, and in this case it is activated by an assumed sensitising agent present in green rape. The facial tissues become swollen and painful, the ears appear very swollen and pendulous, and the skin of the back may be tender and inflamed. A yellow lymph fluid may ooze from the affected skin surface. Though there is no liver damage and jaundice, such as occur in facial eczema, the lambs suffer a setback in their rate of fattening. Affected lambs seldom die.

Experience indicates that rape scald occurs most commonly in lambs placed on green, immature rape. It may occur to a less extent in an apparently mature crop under the humid

conditions that stimulate a fresh growth of leaf. Most farmers are accustomed to a few cases of rape scald and may remove the lambs temporarily only if the trouble is severe and the crop fairly green.

To prevent scouring and rape scald it is wise to introduce lambs to mature rape during dry weather when the leaves are not covered with excessive moisture.

The recovery growth of rape that follows the first clean-up is generally considered much poorer in fattening quality than the first growth. This may be partly because the second growth is commonly fed when immature, and better results may be obtained if the recoveries are allowed to mature well. Most farmers prefer to use second-growth rape for flushing the ewes before tupping. It is excellent for this purpose.

Rape and Grass

A double-purpose result from one seed-bed preparation can be achieved by sowing down rape with a pasture seed mixture of either short- or long-rotation type. The pastures usually establish well, but it is evident that the mixture of feed is usually not as good as rape alone for the fastest fattening. In wetter seasons or in more humid districts the sole of grass and clover will favour the development of parasitism. For this reason it is advisable to feed a crop of this nature in small breaks of no more than a 7-day capacity in areas where internal parasites are likely to be troublesome.

Italian ryegrass sown down with rape in the dry areas will give a more reliable supply of fattening feed when the rape may fail from aphid or other insect attack.

Thousand-headed Kale

As a fodder crop for fattening weaned and store lambs thousand-headed kale has certain advantages over rape that commend it for greater use by farmers in districts where rape is slow to mature or is uncertain in yield because of disease or pests.

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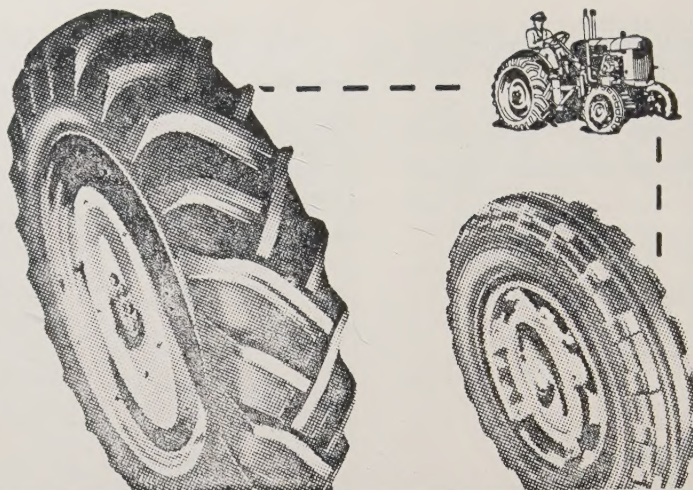


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. . . FATTENING WEANED AND STORE LAMBS

Rape and kale were compared critically in a lamb-fattening test during three seasons at the Manutuke Research Station, Gisborne (recorded in the "Journal" for October, 1947). On the Gisborne flats thousand-headed kale proved superior to all other crops for general use. The daily liveweight gain of the lambs was as good on the kale as on rape, and the kale can be fed safely at any stage of growth.

With kale the farmer need not worry about the problem of immaturity or over-maturity of the foliage, and in dry seasons the lambs can be weaned off the deteriorated pastures earlier if kale is available instead of immature rape. It is apparent that kale is a more reliable crop than rape in dry districts. In Poverty Bay kale has proved very useful in drought seasons and, because of its good recovery after autumn grazing, for providing winter and early-spring feed. As a rule it recovers well after being fed off, and four lots of grazing may be obtained from January to August. The seed is usually sown in October in 14in. drills and there is sufficient growth for feeding by mid-January onward.

Crops of kale are grown frequently in the Wairarapa, Hawkes Bay, Gisborne, Southland, Mid-Canterbury, and North Otago districts. In districts where rape grows well and matures well kale is considered to be a little slower as a fattener than rape.

The principles of feeding kale are much the same as those of feeding rape. No additional supplements are necessary. Because it is relatively unpalatable it must be fed in small breaks, and the lambs should be moved on rapidly. The regrowth is just as valuable as the first growth.

Sweet Blue Lupins

A crop which can also be available for lambs at weaning time, sweet blue lupins were grown to some extent in former years on the lighter lands of Canterbury, particularly in the Ashburton district. In this area they are not troubled seriously with the diseases collar rot and mosaic, which limit their usefulness in North Island districts. Not only do lupins fatten lambs well, but they also fix nitrogen in the soil and thereby assist to build up the fertility of light lands. Sweet blue lupins are usually ready to feed about 11 weeks after being sown, and the fattening value is good from just before flowering up to the seed-pod stage. They may be sown with grass, rape, turnips, or oats. The rape or turnips are usually eaten first, and by the time they are eaten down the lambs are settled into the lupins. A mixture of this nature guarantees a crop of fattening feed in seasons when rape or turnips are failures.

Lambs do not start to feed on lupins as readily as they do on kale or rape, and the useful feeding period is much shorter.

Chou Moellier

Generally regarded as an autumn fattening crop for stores and late lambs, chou moellier is commonly grown for fattening in the east coast districts of the North Island, though it can grow well in most districts.

Chou moellier can be grown on lighter lands as well as on heavy, moist soils. It is more resistant to club root and insect pests than either rape or turnips and is also more reliable than rape in drought conditions. For these reasons it is popular as a substitute for rape for autumn fattening feed. The foliage can be fed at any stage of growth and does not become over-mature as does that of rape.

Depending on the time of sowing and the district, chou moellier can be ready to feed in February. It is usually sown in October or November to be ready in late February and March. The lambs can be fed continuously in subdivisions on the same principles as those followed in feeding rape.

Root Crops

The three root crops commonly used for the autumn fattening of stores and later lambs are soft (white-fleshed) turnips, yellow-fleshed turnips, and swedes. The turnip varieties are much the same in their capacity to fatten lambs. They are particularly suitable for use after rape or lupins have been fed off earlier in the season. On the east coast of the North Island turnips are good for fattening lambs and they yield a large amount of feed. Turnip and kale crops gave considerably more feed per acre than rape at Manutuke, where they are preferred for fattening. Two varieties of turnips, Purple Top and Hardy Green Globe, when sown at Manutuke in October are ready for feeding toward the end of January. The earlier-maturing Purple Top is ready before the Hardy Green Globe. A light grazing of the leaf is taken first; the leaves grow again and supply two grazings, followed by bulbs.

The type of turnips chosen will be determined largely by soil type and climate. Soft turnips grow more rapidly than swedes and are used successfully on the drier, lighter lands. Swedes grow to advantage where the rainfall and soil moisture are more abundant. Yellow-fleshed turnips are confined chiefly to the colder districts of Otago and Southland. In Canterbury and Otago turnips are used frequently and satisfactorily as a mixed sowing with pasture. Lambs will fatten satisfactorily on swedes, especially if the top growth is good.

Early varieties of soft turnips sown in October-November may be ready for use in January-February and can remain in a suitable state for feeding over a longer period than rape. Store lambs should be dipped, then settled down on pasture, and drenched before going on to turnips; break feeding can be adopted as with rape and kale. Experience at Manutuke has shown that it is advisable to sow two varieties, Purple Top and Hardy Green Globe, in adjacent areas. When ready they should be utilised in this order: Light grazing of Purple Top, then light grazing of Green Top, followed by feeding the Purple Top bulbs and finally the Green Top bulbs. By this method a supply of good feed can last for 2 months.

Attacks by fungous diseases and insect pests are often severe on

turnips, and farmers in many districts prefer crops more resistant to these diseases and pests.

Stubbles and Aftermaths

After the completion of harvesting operations in grain-growing districts an undergrowth of grasses, clovers, and weeds is usually available among the stubble. Where lambs are fattened on the same property the weaned or store lambs are usually fed on these stubbles for what they are worth and depending on what alternative feeds are available at the time. Lambs will do very well on stubble as long as a succulent bite of undergrowth such as clovers and weeds is available. Where stubble can be fed it is a good practice to sow down some red clover seed with a spring-sown cereal and thereby enhance the feed value of the stubble.

In the pasture seed-growing areas of New Zealand special pastures of perennial ryegrass-white clover, short-rotation ryegrass-white clover, or Italian ryegrass-red clover are sown down, mainly with a view to seed production. These seed crops are usually harvested in January, and then the aftermath or bottom growth becomes available for stock feed. The aftermath of ryegrass-white clover may provide useful grazing for several days, extending from weaning time to the time when the rape is ripe and ready. The aftermaths of hay crops are used similarly.

As the pasture seed-growing and cereal areas of New Zealand are in regions of lower rainfall, the stubbles and aftermaths vary considerably with the amount of moisture in spring and summer. They are clean, parasite-free feeds for weaned lambs.

Special-purpose Pastures

In the drier areas of the South Island, particularly in Canterbury, the use of special-purpose pastures for the provision of autumn fattening feed is rapidly becoming popular. A seed mixture of Italian or short-rotation ryegrass and clovers is sown down in December or early January on fallowed land, which ensures a maximum of establishment and production. This pasture will usually provide sufficient feed for fattening lambs in about 8 weeks from the date of sowing.

At Manutuke a mixture of short-rotation ryegrass and white clover which was spelled for 2 to 3 weeks after weaning in December became dominant in white clover, and the lambs grew as well on this as on crops.

A young growth of pasture compares favourably with any other feed for the rapid fattening of lambs, provided only that the weather is not so wet that excessive scouring is caused.

Lucerne

Experience with lucerne, an outstanding forage crop, over many years provides reliable evidence that lucerne should be more extensively used by farmers in many parts of New Zealand. In the form of hay lucerne is unsurpassed in nutritive quality for

FATTENING WEANED AND STORE LAMBS . . .

the supplementary feeding of animals at any time of the year. Lucerne hay is a valuable supplement to give lambs fattening on rape, chou moellier, or turnips during moist periods.

In the drier areas of the Dominion, particularly in North Canterbury, Marlborough, and Hawkes Bay, established stands of lucerne are of special value for fattening lambs in times of droughts. Under such conditions lucerne may be the only crop making fresh, vigorous growth. Grazing lucerne by lambs is usually done in February and March after the second or third cut of hay and when the new growth is about 4in. high. The discriminate grazing of lucerne does not seriously damage established stands, but the grazing of lucerne in its first year is considered inadvisable.

Japanese Millet

Japanese millet has been grown at Manutuke and tested for its lamb-fattening ability. When sown in October it was ready in January and was fed in breaks. Lambs fattened slowly and unsatisfactorily at an average rate of 0.25lb. per day. During the feeding of this crop lambs may suddenly develop a photosensitisation (sunburn) resulting from the effects of a rapid liver-cell swelling. On one occasion after 300 lambs had fed on Japanese millet for a week 120 of them were affected.

Diseases of Lambs

Enterotoxaemia (Pulpy Kidney)

The commonest cause of sudden deaths in lambs which have been fattening satisfactorily on crops or pastures is pulpy kidney, caused by the bacillus *Clostridium welchii* Type D. This bacillus can multiply rapidly in the intestines and liberate a powerful toxin or poison, hence the name enterotoxaemia.

It is not known why the bacillus suddenly attacks sheep nor why lambs on good feed should be susceptible.

Outbreaks of the trouble are, however, often associated with a sudden change-over from pasture to a supplementary fattening crop. The change in feeding should be spread over a few days, beginning with 2 or 3 hours only on the fattening crop on the first day, with reasonable increases daily.

Deaths from pulpy kidney are usually very sudden and commonly occur in good lambs a few days and up to 2 or 3 weeks after they have gone on to rape, turnips, or other fattening crops. A sub-acute type of enterotoxaemia, with symptoms of loss of control of limbs, paralysis, and blindness for a few hours to several days before death, is also known. A post-mortem of a typical death is a valuable aid for diagnosis and it is best to delay this examination for 3 or 4 hours after death in order that typical lesions will be found. The kidneys should be examined carefully and incised. If affected with pulpy kidney, they will be soft, sticky, and pulpy, but this is not a constant finding. More reliable lesions are found in the region of the heart. The heart is enclosed in a sac (the pericardium) which normally contains a small amount of clear fluid.

Enterotoxaemia causes the heart sac to be abnormally distended with yellowish or reddish fluid, and both the outer and inner surfaces of the heart wall will show numerous small hemorrhages resembling tiny blood splashes. Laboratory confirmation is usually done by testing the contents obtained from the last portion of the small intestine.

Outbreaks of this disease can cause considerable losses each year in lambs on fattening crops on many farms. These losses can be prevented satisfactorily by the use of enterotoxaemia vaccine. Weaned lambs or bought-in stores should be vaccinated several days before going on fattening feed, because it takes 10 to 14 days to get an effective immunity after the inoculation. In most vaccinated lambs

enterotoxaemia vaccine causes a nodule or blemish at the site of injection. If the vaccine is injected into the brisket, shoulder, or thigh, these blemishes may cause carcasses for export to be rejected at the freezing works. It is important that the vaccine be inoculated under the loose skin inside the elbow if the lambs are to be sold for slaughtering in export freezing works. Inoculation at this site will not cause rejections at the works.

Confirmation of enterotoxaemia (pulpy kidney) disease and instructions for the use of the vaccine should be obtained from the nearest Veterinarian or Inspector of Stock.

Scabby Mouth or Contagious Ecthyma

Scabby mouth is an infectious virus disease affecting both sheep and goats which causes thick, dark scabs on the lips. It frequently affects lambs fattening on crops and appears to be more severe where thistles are common. The disease has been attributed to the effect of thistles, crop stubble, and other hard forms of vegetation on which the animals have been feeding. Research work has, however, shown that the disease is infectious and that it is transmissible to humans. The virus resists drying, and natural cases result from the accidental inoculation of small abrasions. Though spines of plants are not the actual causes of the disease, they assist in its spread by making minute abrasions of the skin and so allowing penetration of the virus.

As this disease can spread rapidly and retard the fattening of lambs, the use of scabby-mouth vaccine is recommended as a simple preventive where the disease is likely to be troublesome. The nearest Veterinarian or Inspector of Stock should be consulted for details of vaccination.

Second-grade Lambs

In order that fat lambs should grade well in the meat works it is important that they should suffer no bad setbacks during fattening, but be kept forward and thriving.

Over a whole season about 20 per cent. of the total lambs killed may grade as seconds, the number varying with the district and the type of season. It is known that 80 per cent. of the lambs so graded are put down to seconds because of lack of finish or condition, and the remainder are accounted for as bruised, yellow, or badly dressed lambs. In the early part of the season, when milk lambs and early fatts are killed, only 10 per cent. may be second grades, but as the season advances the percentage of seconds rises to a maximum in the late fattening drafts.

Too much stress cannot be laid on the importance of careful management and frequent critical inspections of the lamb flock to detect as early as possible any evidence of excessive scouring, unthriftiness caused by detrimental condition of the feed, or checks in condition or anaemia associated with the ravages of stomach worms.

In far too many cases flocks of lambs have suffered an unduly severe setback before an appropriate diagnosis and correction have been effected, which in turn has been reflected in higher percentages of second-grade lambs slaughtered off the properties concerned.

DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during November and for the 4 months ended November 30, 1950, with comparative figures for the same month and 4-monthly period of 1949, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

Period	Creamery	Tons Whey	Total	Percentage inc. or dec.	Tons Total in store at end of mth.
November, 1950	21,949	410	22,359	—	32,713
November, 1949	23,405	418	23,823	—	33,374
Increase or decrease ..	-1,456	-8	-1,464	-6.145	-661
For 4 months ended 30/11/50	65,885	1,196	67,081	—	—
For 4 months ended 30/11/49	68,688	1,150	69,838	—	—
Increase or decrease ..	-2,803	+46	-2,757	-3.947	—

CHEESE—

Period	White	Tons Coloured	Total	Percentage inc. or dec.	Tons Total in store at end of mth.
November, 1950	14,972	22	14,994	—	20,687
November, 1949	12,112	3,403	15,515	—	18,220
Increase or decrease ..	+2,860	-3,381	-521	-3.358	+2,467
For 4 months ended 30/11/50	35,673	1,245	36,918	—	—
For 4 months ended 30/11/49	27,859	7,901	35,760	—	—
Increase or decrease ..	+7,814	-6,656	+1,158	+3.238	—

If these figures are converted into butterfat equivalent, there is a decrease of 2,640 per cent. in butterfat graded for the 4 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

HORMONE WEEDKILLERS FOR SCRUB CONTROL

INTERIM CONCLUSIONS FROM DEPARTMENTAL EXPERIMENTS

By L. J. MATTHEWS, Weeds Research Officer,
Department of Agriculture, Wellington.

HORMONE weedkillers available commercially in New Zealand may be considered in three main groups according to the types of plant against which they are effective.

1. Hormone weedkillers which control herbaceous and semi-woody annuals and perennials.
2. Hormone weedkillers which control semi-woody and woody perennials commonly termed "brush" or "scrub" plants.
3. Hormone weedkiller mixtures which control assorted vegetation of both the foregoing groups.

This article summarises conclusions based on experiments in the control of "brush" plants (Group 2) with 2,4,5-T.

IN the control of herbaceous and semi-woody plants of Group 1 hormone weedkillers of M.C.P. acid base (2 methyl, 4 chlorophenoxyacetic acid) such as "Agroxone" and "Phenoxyline" and those of 2, 4-D acid base (2, 4 dichlorophenoxyacetic acid) such as "Weedar 77" are used widely. For semi-woody and woody plants of Group 2, hormone weedkillers of 2,4,5-T acid base (2,4,5 trichlorophenoxyacetic acid) are used. For the mixed vegetation of Group 3, mixtures of 2,4,5-T and 2, 4-D are employed; for example, a mixture of 2,4,5-T and 2, 4-D, if correctly applied, would secure effective control of a mixed association of gorse and scotch thistle.

HORMONE OR PLANT-GROWTH REGULATING TYPES OF WEEDKILLERS

Class of weedkiller	Proprietary Name	Acid equivalent (2,4,5-T or 2, 4-D) per gallon	Form of weedkiller	Volatile or non-volatile
*Butyl ethyl ester	—	3.6 2,4,5-T	Oil based	Volatile
Butyl ester	Rellonus 2,4,5-T Weedkiller Special (F.N.995)	3.6 2,4,5-T	Oil based	Volatile
Butoxy ethanol ester	—	3.6 2,4,5-T	Oil based	Non-volatile
*Triethanolamine salt	—	3.6 2,4,5-T	Oil based	Non-volatile
Triethanolamine salt	Rellonus 2,4,5-T Weedkiller	3.5 2,4,5-T	Water based	Non-volatile
Butyl ester 2,4,5-T	Trioxone	2 2,4,5-T	Oil based	Volatile
Ethyl ester 2, 4-D		2 2, 4-D		
Butyl ester 2,4,5-T	Stantox T.45	2.1 2,4,5-T	Oil based	Volatile
Ethyl ester 2, 4-D		1.9 2, 4-D		
Butyl ester 2,4,5-T	Scott's Blackberry Killer	2 2,4,5-T	Oil based	Volatile
Ethyl ester 2, 4-D		2 2, 4-D		
Butoxy ethanol ester 2,4,5-T and 2, 4-D	Brush Killer "32"	.79 2,4,5-T 1.6 2, 4-D	Oil based	Non-volatile

* Available only as experimental mixes; Not available commercially.

When rates per acre of the hormone weedkillers are referred to they will be given in pounds of acid (2,4,5-T and 2, 4-D) equivalent. The hormone weedkillers have many advantages in that they are non-poisonous to animals, non-corrosive, relatively easy to use, are effective against a wide range of weeds, and do relatively little damage to pastures and, in the case of 2, 4-D and M.C.P. acid, to cereal crops.

An important feature of the table on this page is that it lists the hormone weedkillers into volatile and non-volatile preparations. Volatile hormone weedkillers under hot temperatures pass off a vapour that can damage susceptible plants to a considerable distance. On the other hand non-volatile preparations do not pass off vapours and are thus particularly valuable in enclosed spaces or adjacent to susceptible plants. However, spray drift from non-volatile as well as from volatile materials may damage neighbouring susceptible crops.

Gorse

Although 2,4,5-T was originally introduced into New Zealand for blackberry control, it has since proved more efficient against gorse; hence the factors influencing the control of gorse with 2,4,5-T will be outlined in some detail. (It must be realised that these conclusions are of an interim nature and may need modification in the light of further research.)

A complete cover of all green parts of the plant is essential. Higher rates of application of the weedkiller do not compensate for inadequate cover. A suggested method to ensure this is to employ low-volume nozzles, a high pressure, and a high volume of water. Perhaps an ideal lance for gorse spraying would be T shaped, with a 28 M. fan-shaped nozzle and a 39 M. solid cone nozzle coupled together at each end of the cross-arm. With a pressure of 80 to 100lb. per square inch the fan-shaped nozzles would deliver a highly atomised spray for surface foliage cover and the cone-shaped nozzles would deliver a driving cone of water into the inner stems and branches.

Time of Application

Spraying during November to February inclusive has given the best results provided drought conditions do not follow spraying. Trial results suggest that high temperatures and fair growing conditions are more important than moderate temperatures plus good growing conditions, especially with volatile formulations of hormone weedkillers.

Stage of Growth

Young gorse is quite susceptible to 2,4,5-T, but becomes increasingly resistant with age. It is probably impracticable to obtain adequate cover of large areas of compacted, mature gorse. Trial work indicates that 2,4,5-T formulations fail to control cut or damaged plants. Thus the control of gorse cut to make tracks to facilitate the spraying of large areas of compacted, mature gorse would be limited.

Evidence from trials indicates that regrowth gorse from old, cut, or burnt root stocks should not be sprayed for 9 to 12 months after cutting or burning, otherwise the area of foliage would be too small to absorb enough spray for root control. Further, it frequently happens that dormant protected shoots grow if the spraying is performed too soon after burning or cutting.

Control is more difficult at normal rates of application if gorse is flowering profusely; the flowers absorb most of the spray and then drop off a few days later. This is especially so if an "acute" oil is used, and to a less degree if a "chronic" aromatic oil is employed.

An acute oil expends its weedkilling properties in a few hours to 24 hours; chronic oil, on the other hand, takes much longer to obtain control. (Examples of chronic oil are kerosene and dieselene.) In addition a profuse flower growth makes it difficult to secure a complete foliage cover with spray.

The less volatile the formulation the more essential is the need for complete cover, and a higher rate-per-acre application of active ingredients is probably required. It is doubtful if a complete kill of gorse can be expected with non-volatile formulations with one application, especially of gorse more than 2 to 3ft. high.

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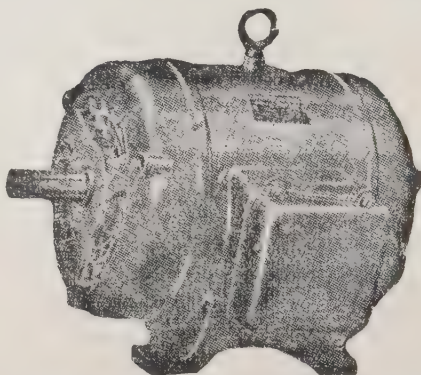
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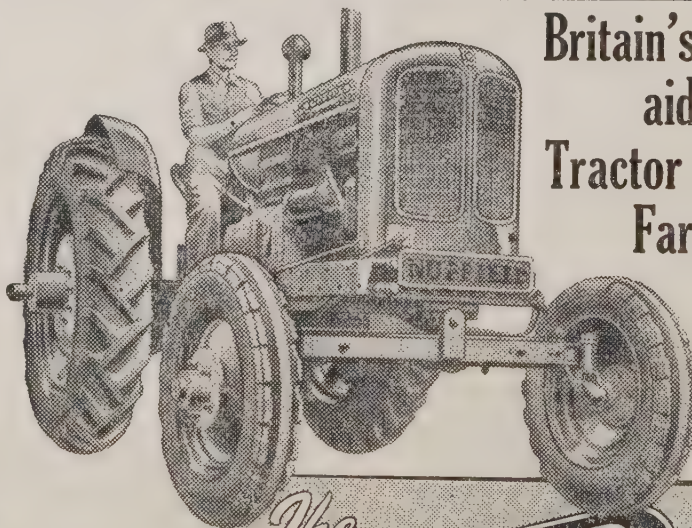
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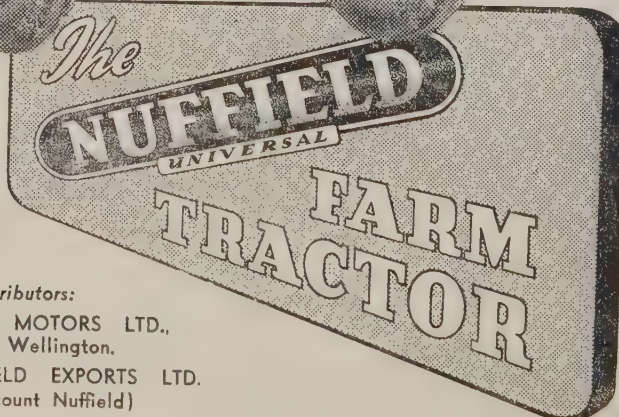
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CONTROL OF GORSE

It is thought that kerosene, dieselene, or aromatic oils minimise the control of gorse secured from 2,4,5-T. These oils have a phytotoxic effect on the plant tissue, impeding the entry of the hormone into the damaged cell. A drop of kerosene falling on a stem would probably damage the adjacent cells, inhibiting the translocation of the hormone either way.

With adverse conditions (cold atmosphere and cold, wet soils) higher rates of application of 2,4,5-T are required and complete coverage is correspondingly more important. The advent of visible damage is prolonged and general recommendations are not to spray under these conditions, particularly "old-man" gorse in flower. In general, gorse is more easily controlled in the northern and warmer areas of New Zealand and kills are obtained with lower rates per acre of 2,4,5-T in those districts.

As gorse ages and becomes increasingly resistant it is more important to have complete cover of the plant, higher rates of application are required, and spraying at the optimum time becomes more essential.

Application of hormone diluted 1:4 with kerosene to cut stumps has failed to give any control of gorse.

Isolated plants are more easily controlled than compacted bushes. With such plants competition for light and food is less severe and complete cover with spray materials is more easily obtained.

There is some indication with mature gorse that, even if a complete foliage and stem check is obtained,



Gorse and broom eradicated with a volatile formulation of 2,4,5-T in the foreground and untreated plants in the background.



The sharp delineation between treated and untreated areas of gorse is shown in the illustration. The area at the left of the posts was treated with a volatile formulation of 2,4,5-T.

regrowths will occur. This indicates that gorse is difficult to control by spraying with 2,4,5-T if it is past the stage at which it will grow if chipped off at ground level.

Gorse growing on poor-fertility soil probably has a shorter time during which 2,4,5-T is effective than is the case with plants growing on high-fertility soil.

Commercial preparations of 2,4,5-T plus 2, 4-D have proved less efficient than straight 2,4,5-T formulations. In general terms the efficiency of the weedkiller depends on its 2,4,5-T content. The non-volatile combinations appear less efficient than the volatile combinations, probably because complete coverage is more easily obtained with the volatile materials.

The triethanolamine salt of 2,4,5-T has proved to be of little value against gorse.

As gorse offers different degrees of resistance for various growth stages, these growth stages are considered separately in relation to the above factors.

Seedling Gorse to 3ft.

Seedling gorse to 3ft. before flowering is at the stage when it can be most profitably treated. In northern districts 1lb. acid equivalent per acre of a volatile formulation of straight 2,4,5-T will give the desired control under optimum spraying conditions.

The non-volatile esters probably possess a higher killing power than the volatile esters, but as has been stressed before cover is very difficult to obtain with non-volatile formulations. A follow-up spray is probably

CONTROL OF BLACKBERRY



Better control has been obtained with blackberry of the nature shown than with young tender regrowths from old root stocks.

warranted. The advantages of a non-volatile formulation are not to be overlooked for enclosed areas or those adjacent to susceptible crops.

The salts of 2,4,5-T (for example, triethanolamine salt), which are non-volatile products, give very unsatisfactory results against gorse and need not be considered further.

Gorse Regrowth to 2ft.

Regrowth gorse is more resistant than seedling gorse, and requires 1 to 2lb. per acre of acid equivalent of a volatile ester of 2,4,5-T.

The non-volatile esters also give excellent control provided the necessary foliage and stem cover is obtained.

Sub-mature Gorse (Large Gorse Still Making Growth)

Best results may be obtained by the use of volatile esters applied at the rate of 3 to 4lb. acid equivalent per acre under optimum spraying conditions.

Over-mature Gorse ("Old-man" Gorse)

Results for all formulations are more doubtful, but the best control has been secured by volatile esters of 2,4,5-T.

Gorse over 3ft. wherever possible should be burnt and the regrowths treated 9 to 12 months after burning for the most profitable control.

To recapitulate, seedling gorse is the most easily controlled, and gorse becomes increasingly resistant with age. Other factors such as time of spraying, completeness of cover of plant with spray, soil moisture, atmospheric temperatures and humidity, rates of application, and volatility become more important as gorse ages and its resistance to the chemicals increases.

The effects on the efficiency of gorse control with 2,4,5-T of the various factors discussed have also to be considered when this chemical is used to control the following plant species.

Broom (*Cytisus* spp.)

Both the common species of broom, and particularly the younger plants,

appear to be more susceptible to 2,4,5-T formulations than gorse.

Manuka (*Leptospermum scoparium*) and Kanuka (*Leptospermum ericoides*)

There is some promise of 2,4,5-T controlling seedling plants to 12in. of these species provided complete cover is obtained. Very little experimental work has been done on these plants as yet.

Spanish Heath (*Erica lusitanica*)

Young plants to 12in. have been controlled with 2,4,5-T provided a complete foliage cover was obtained.

Tree Lupin (*Lupinus arboreus*)

It would appear that more satisfactory control of tree lupin may be obtained by the use of a volatile formulation of 2,4,5-T at 1lb. acid equivalent per acre on lupin more than 12in. high than is secured with an oil-based ester of 2, 4-D at 1 to 2lb. acid equivalent per acre.

Blackberry (Mainly *Rubus fruticosus*)

The action of 2,4,5-T on blackberry is similar to that on gorse, although trial results indicate that the obtaining of a complete cover of the plant with spray is not as important as it is for gorse. This effect is probably associated with the physiological growth habit of the plant. Translocation is in general more rapid in vines than in woody stems, and 2,4,5-T hormones are certainly translocated to a greater degree in blackberry than in gorse.

The blackberry plant is more susceptible to 2,4,5-T than is gorse. This is indicated by the check given with the triethanolamine salt of 2,4,5-T or with an application of 0.79lb. acid equivalent per acre of 2,4,5-T in a non-volatile combination of 2,4,5-T and 2, 4-D. The complete foliage check given with the non-volatile products emphasises the fact that cover is probably not as important with blackberry as with gorse, especially under good spraying conditions.

Kerosene and 2,4,5-T applied to freshly cut stumps of blackberry have given no control; regrowths have been strong, especially when treatments have been made to stumps under conditions suitable for active growth. Different results have been achieved with the various formulations of 2,4,5-T for different months. Trials indicate that under good growing or spraying conditions (December to February inclusive) the triethanolamine salt gives the best results. Areas of blackberry treated with 3.6lb. acid equivalent per acre of the triethanolamine salt have taken up to 3 months to die off to ground level. This indicates that the food metabolism process in the plant is slowly upset, causing a slow process of starvation. This slow but continuous action greatly reduces the food reserves of the roots, thus curtailing regrowths.

The esters, on the other hand, under good spraying conditions cause a very rapid foliage check to ground level (no difference being observed between volatile and non-volatile formulations) followed by vigorous regrowths. This was particularly noticeable at rates of over 3.6lb. acid equivalent per acre of the esters. Low per-acre applications of the esters (0.75lb. acid equivalent per acre) gave a fairly slow check, although it was more rapid than was obtained with the triethanolamine salt, followed by relatively few regrowths.

The addition of aromatic oils (kerosene and dieselene, etc.), especially if used as a diluent to the 2,4,5-T esters under good spraying conditions, causes an even more rapid kill of foliage to ground level. Regrowths occur following this rapid stem kill.

Under adverse spraying conditions (during March to August) when the blackberry appears more resistant the triethanolamine salt has given no check to blackberry in trials. The esters under these conditions, particularly in the March application, have given an equivalent slow foliage check to the triethanolamine salt under good growing conditions and to date no regrowths have occurred.

From May onward the blackberry becomes increasingly resistant and results obtained are poor before October. In experiments no marked check to growth has been obtained if young canes have been sprayed. The canes must be old and hardened before being treated.

Interim Results Only

The reaction of a number of plants to hormone weedkillers of 2,4,5-T formulations has been summarised. The results must be considered of an interim nature until confirmed by further experiments.

Further detailed work will be conducted with different formulations and wetting agents in an attempt to obtain materials which will give control of gorse without the necessity of paying such careful attention to the obtaining of a complete spray cover of the plant. Further work is required to determine optimum rates of application, which it is anticipated will vary with locality, climate, and growing season.



FARMING IN CANTERBURY

THE two previous articles in this series, which appeared in the November and December issues of the "Journal", described the development of farming in Canterbury between 1850 and 1900. The article, which has been compiled by P. R. Stephens, Assistant Investigating Officer, Department of Agriculture, Wellington, from notes supplied by officers of the Extension Division, deals with the period 1900-1920, and the final article, to be published in next month's "Journal", will describe the period between 1920 and the present day.

In the last quarter of the 19th century there was a general fall in prices all over the world corresponding roughly to the general decline in gold production from 1870. Prices for primary products were more affected than others, as the world supply had greatly expanded with the opening up of railways of new farmlands in North and South America and eastern Europe. Yet the decline was fairly slow and not by any means regular, with several false dawns to suggest that the depression had lifted and the optimistic advance of earlier decades could be resumed. New Zealand in 1880 was almost entirely dependent on three staple exports, wool, gold, and wheat, with returns from the last two uncertain and flimsy. Gold production had already declined and though wheat exports reached their highest level in 1881 New Zealand was far from the British market and was in competition with other exporting countries and wheat prices fluctuated sharply, often converting a seemingly profitable deal into a dead loss.

For most of the people in New Zealand 1880 opened a dark gloom and uncertainty. Unemployment was serious everywhere and perhaps worst in Christchurch, the land boom had collapsed leaving late purchasers with heavy mortgages to pay off and Government expenditure had been reduced

and private works scaled down. For some of the unemployed the situation was so desperate that a petition to the President of the United States of America was organised asking for assistance to leave New Zealand. The most disillusioned would be those who arrived during the Vogel boom with promises of steady employment and an opportunity to use their skill. L. G. D. Arland mentions that in 1879 at Stonyhurst the number of men looking for work at the start of the shearing season was so great that two used hands were engaged to work for their "tucker".

Profound Effect of Depression

In the newspapers of the time Vogel's booming policy was held up as the cause of all this. The £30,000,000 added to the national debt being considered an intolerable burden for a country with only £10,000,000 in assets. Yet in the end the depression was to have a profound effect on the country's social and political life even if its immediate effect was to delay progress in both spheres. Sir George Grey led an "emergency" Liberal ministry from 1877 to 1879, but the continuous ministry in which Sir John Hall and Sir Harry Atkinson were the leading figures occupied the stage dur-

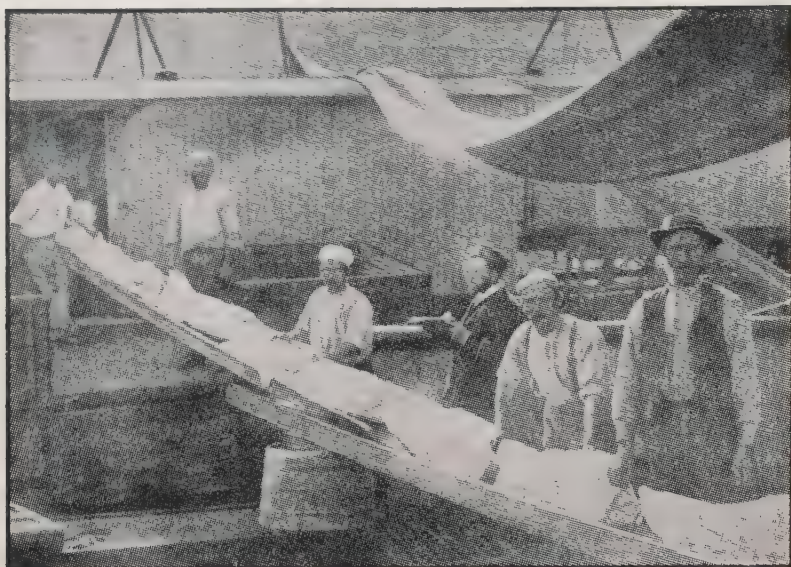
ing most of the period apart from the Stout-Vogel interlude from 1884 to 1887.

Paradoxically as was found 50 years later, farm production did not suffer during the period of depressed prices. The value of overseas exports from the ports of Lyttelton and Timaru increased from £1,500,000 in 1880 to £2,876,000 in 1890, a striking increase when the price of wool was falling. Between 1881 and 1890 Canterbury's sheep flocks increased from 3,519,000 to 4,950,000, an increase which could not, however, be sustained, as the number in 1891 had dropped to 4,307,000. Wheat acreages fluctuated more, 240,000 being sown in 1883, dropping 3 years later to 119,000, but picking up again to a record of 279,000 in 1892. Merino wool prices remained fairly steady from 1880 to 1884 at from 10½d. to 11d. per pound, dropping to about 8d. in 1886 and 1887, picking up again to 10½d. in 1889, and then dropping steadily to 6½d. in 1894-95. From then recovery was fairly steady. Wheat prices followed a roughly similar course, reaching their maximum of 4s. 3½d. in 1882, dropping to 2s. 11½d. in 1886, picking up the following years and reaching 4s. again in 1892, and dropping once more to 2s. 5d. in 1894.

The success of the frozen-meat shipment in 1882 made the prices for fat sheep of special importance to the Canterbury farmer and runholder, but

HEADING PHOTOGRAPH: Wheat yields in Canterbury rose markedly from 1900 onward, when the effects resulting from the development of the frozen-meat trade began to be felt. This North Canterbury harvesting scene was photographed in the early 1900's. From the Alexander Turnbull Library photographic collection.

CLOSER LAND SETTLEMENT



Loading frozen meat at Lyttelton from the Belfast works about 1900. Canterbury lamb by this time had come to symbolise quality and the raising of meat for export had become the mainstay of Canterbury farming.

exact calculation of meat and stock prices is more difficult. Between the time that the demand for sheep for stocking of runs had fallen off and the beginnings of the meat trade the price for store sheep on the local market was more or less nominal. But better-quality sheep always sold for a higher figure and the beginnings of the meat-export trade did not stimulate prices as much as might have been expected. Prices at the Addington market between 1880 and 1884 for prime cross-bred ewes were from 5s. to 10s., rising in 1885 to 11s., but dropping after that to 6s. in 1888 and 1889. Thereafter the price ranged from 8s. to 10s., with inferior store ewes selling as low as 2s. A more rapid rise began in 1899.

Attention has usually been focused on the readjustments that large runholders were compelled to make in the face of these continued low prices, and less attention has been paid to the manner in which the small farmer faced up to his difficulties. On the whole he seemed to fare better. Meat freezing relieved him from his dependence on wheat, the productivity of his farm would be raised by adopting a better system of crop rotation, and his scale of spending must have been more in keeping with his means, but, on the other hand, he faced many difficulties. Long- and short-term credit could be obtained only at high rates of interest, the stock and station agencies as well as the early freezing works were designed primarily to assist the large runholder, freight rates and insurance premiums were high, and there was no organisation to which he could turn for help and advice.

New Lease of Life for Runholders

The large runholder, like everyone else, must have received a severe knock from the fall in wool prices in

1879, especially as most runholders had been buying up the freehold heavily during the land boom, but the fairly stable prices for wool from 1880 to 1885, the decline in wages, and the plentiful supply of labour, as well as the beginnings of the meat trade, must have given him a new lease of life. Perhaps the cause of his later difficulties was his failure to make sufficient adjustments in his way of life.

Bank deposits and assets reached their maximum in 1886 and the most significant assets were large properties held as securities against advances. In New Zealand the banks, especially the Bank of New Zealand, had lent freely against the security of land, a practice frowned on by conservative English bankers at the time. From 1886 bank assets were progressively written down and did not regain their 1886 level until 1903. From 1885 a growing number of properties fell back into the hands of banks and stock and station agencies; by 1890 the Bank of New Zealand was controlling seven stations in Canterbury, the New Zealand Loan and Mercantile Agency Company eight, and the Bank of New South Wales two.

For the runholder who was in difficulties the only solution was to cut up his property and sell it, but his dilemma was aptly stated by W. Pember Reeves: "He could not afford to cut up until the price of land rose; the price of land could not rise until the large estates were cut up".

Land Monopoly

Overshadowing everything else during the 1880's and early 1890's was the question of land monopoly and closer settlement. Pember Reeves said of the pre-1890 political scene: "The influence, social and political, of the few hundred persons that owned or leased

the many millions of acres held against settlement by the great proprietors was overwhelming. The more enlightened and thoughtful of their politicians who recognised that large holdings, or most of them, had become an anomaly and ought to go, could only suggest that the country should wait for the voluntary process of subdivision that would go on as a gradual result of social change." Reeves also emphasised the gravity of another related problem, the plight of the seasonal labourers on farms and sheep stations.

In the Canterbury Land District in 1890 there were 120 estates of 5000 acres or more of freehold, their area being 1,718,000 acres, and the total area freehold was 3,762,000 acres. This, of course, excludes the large area held under pastoral licences. In the same year there were 121 owners of 10,000 or more sheep. How far closer settlement proceeded in the 1880's is rather a moot point, as the rural population, after a marked rise in 1878 to 1881, rose very slowly over the next 10 years (from 71,000 to 73,000). The number of holdings in Canterbury rose from 5010 in 1881 to 7804 in 1891. Part of the increase may have been caused by individuals purchasing several properties, but even before 1890 several blocks of land had been cut up wholly or in part around Christchurch and Ashburton.

The number of sheep owners showed a very marked rise from 1548 in 1879 to 2801 in 1890, but this increase probably resulted from smaller farmers turning to mixed farming and not relying wholly on wheat. Yet even if real progress was being made in closer settlement, the mood of the time and the interests of progress demanded that something more be done.

Deferred Payment System

Opportunities for people of limited means to acquire land were provided by the deferred payment system and the small grazing run lease, and undoubtedly many people were assisted in this way. But in Canterbury any scheme came up against the inescapable fact that practically all the better-class land had been freehold and the only Crown land available for closer settlement was in the hill country—cold comfort for the small agricultural farmer. If he wanted land, he had to go north, yet the sight of large areas of fertile land occupied only by sheep and often still in tussocks excited intense indignation, and the knowledge that the land laws framed to limit aggregation were being evaded added to the feeling. In Parliament, in newspapers, and in pamphlets denunciations of land monopoly were frequent, the most effective pamphlet being: "Are We To Stay Here?" by the surveyor A. J. Sealey, published in Timaru in 1881.

Though much criticism was levelled against it at the time, the New Zealand and Australian Land Company, which owned four large properties in Canterbury—Acton, Levels, Pareora, and Hakataramea—was a progressive and far-sighted organisation whose directors recognised that sooner or later the land would have to be subdivided. The company was formed to sell land after it had been developed, and up to 1890 was the

largest seller in New Zealand apart from the Government. It also helped farming generally by its progressive management and stock-breeding policies.

Defenders of the status quo replied to all these criticisms by declaring that only those with capital could improve the land's productivity, that those who did so on a large scale were public benefactors, and that in the normal course of events the land would be divided up when the time was ripe. Professor Wallace, of Edinburgh, who travelled through New Zealand in 1889, expressed this feeling when he wrote: "The people who are most anxious to see the squatter taxed so that he would be forced to sell usually hope to have a share in the spoil. No milder term than spoliation will adequately describe what would happen if the proposals were carried out. . . . Land is acquired in the early stages through a process of natural selection; the best men for the rough pioneering life push forward and reap the rewards. Those who lag behind have to be contented with the crumbs." But the force of this Darwinian logic was not sufficient to impress the people of New Zealand, for by 1890 the feeling against large estates, and their owners, the "social pests" of Pember Reeves, was particularly strong and was reinforced by a return published in 1890 showing the value of freehold estates of 5000 acres or more, subdivided into those held by companies, by absentees, and by people in New Zealand.

LAND REFORM

The election of 1890 was fought very largely over the land question, and the success of the Liberal Party could be taken as an expression of profound dissatisfaction with the existing state of affairs. The new Government came into office with a programme which included the prevention of land aggregation, the checking of "dummyism", and the discouragement of absenteeism

. . . BREAKING UP OF LARGER ESTATES

and land speculation. These were more than empty slogans, the new Minister of Lands, John McKenzie, having the strength and the energy to carry them into effect. The Government's scheme to encourage closer settlement was eventually supported by three main props, the graduated land tax, the compulsory acquisition of land for settlement, and a system of advances to settlers.

Two significant measures were introduced into Parliament in 1891. The first when passed repealed the property tax and substituted a progressive land and income tax, the land tax being designed to encourage the subdivision of large estates. Though the Act was not severe by modern standards, it undoubtedly stimulated the forces already at work. As a check against low assessments it included a provision allowing the taxpayer to call upon the Government to accept his valuation or take over the property at the same figure. The second measure, the Land Bill of 1891, which was intended to consolidate and tighten up existing statutes and including power for the compulsory purchase of land, was dropped, but the following year the Government was more successful, except that compulsory purchase had been whittled down to voluntary purchase. John McKenzie believed that the granting of the freehold and the checking of land monopoly were quite incompatible, but in the 1892 Act the compromise of the "lease in perpetuity" was inserted to satisfy supporters of both the freehold and the leasehold.

State Purchase of Cheviot Estate

An opportunity to show the benefits that could be derived from closer settlement came with the purchase of the Cheviot estate in 1893. After a dispute over its valuation for tax purposes the trustees demanded that the

Government accept their valuation of £260,000 or take over the property. At the time the Government's finances were rather strained, but the Minister of Lands eagerly seized the opportunity. The 84,000 acres supported about 80,000 sheep and 80 people. Within a year the number of people had risen to 650, though the number of sheep had fallen off.

Finally, in 1894, the Land for Settlement Act gave power for the compulsory acquisition of land for closer settlement and authorised the expenditure of £250,000 a year for this purpose. Under the scheme for voluntary purchase a large amount of land had been offered, but invariably the price was excessive, and in Canterbury only two small properties at Pareora and Studholme were bought, in addition to Cheviot. In the year after the passing of the Act not much was done beyond acquiring two properties of 7000 acres, Patoa and The Peaks, which had been part of the Midland Railway reserve.

In 1896 the Highbank property of 9000 acres was acquired, and in the following year another 30,000 acres were added, the Albury Station of 19,000 acres owned by the Bank of New Zealand Assets Realization Board being the largest; land was also purchased near Temuka, Rakaia, and Hawarden, the last being part of the Horsley Downs Station. Part of the Anama estate was taken over in 1898, and the following year Waikakahi was purchased from Allan McLean for £323,000. The 48,000 acres of this estate formed one of the best properties in Canterbury and was divided into 162 farms and small grazing runs. So keen was the demand for land that over 700 people entered the ballot, a vivid description of which was given by the American observer Demarest Lloyd in his book "Newest England". By 1900



Purchased by the Crown in 1893, the Cheviot estate soon showed clearly the advantages to be gained from closer settlement. This view, photographed about 1890, shows the homestead in the distance and the woolshed in the left foreground.

CLOSER SETTLEMENT IN CANTERBURY . . .

the Government had purchased 212,000 acres, including the Cheviot estate, at a cost of just under £1,000,000.

Rural Credit Facilities

The third prop to the Liberal Government's scheme for closer settlement was formed by the Advances to Settlers Act, which was also passed in 1894. Demands for improvements in both long- and short-term credit facilities became very strong during the 1880's, when the burden of debt contracted at high interest rates during the land boom began to be felt.

In 1884 a Mid-Canterbury schoolmaster named Newlyn began canvassing for a scheme by which the Government would borrow overseas and lend to co-operative associations of farmers which in turn would make advances to individual farmers. At the time interest rates on farm mortgages were from 8 to 10 per cent. The following year a Parliamentary Committee investigated rural credit and recommended that the Government should take some action, but nothing came of the report. The provision of mortgage finance was in the hands of numerous bodies and individuals, the market being totally unorganised and the emphasis on assistance to the larger runholder and not to the small farmer. The Advances to Settlers Act was intended to remedy this position by using the national credit to borrow cheaply overseas and to lend to farmers at low rates. Like the Land for Settlement Act, its importance may have been greater indirectly than directly, for one of its immediate results was to bring down interest rates and compel the provision of better credit facilities.

Most of the advances made in the first few years were for paying off existing obligations, which shows that the terms must have been relatively favourable. Less use seems to have been made in Canterbury of the credit facilities offered by the State than elsewhere. Up to March, 1901, only £219,000 or just under 7 per cent, had been advanced in Canterbury out of a New Zealand total of £3,245,000.

The land was fully developed, unlike most of that being taken up in the north, and the farmer taking over a property would not need much capital beyond a 4-horse team and a few implements. Besides, there was probably a greater supply of capital available in Canterbury for investment in farm mortgages, the owners of which were not prepared to export it to other parts of New Zealand where they could not immediately oversee its use.

Acquisition of More Estates

From 1900 several more large properties were taken over, including the Pareora estate of 8000 acres from the New Zealand and Australian Land Company, the Three Springs estate of 7000 acres, two portions of the Lyndon estate of 20,000 acres, some 10,400 acres of the Opawa Station, and in 1903 the balance of the New Zealand and Australian Land Company's Levels estate of 38,000 acres, which was renamed Rosewill. The Highfield estate of 32,700 acres was acquired about the same time, and in 1906 the Kinloch estate of 14,000 acres on Banks Peninsula.

After this there was a few years' halt. At the beginning of the century forms of land tenure were the subject of the most prolonged debate, and in spite of John McKenzie's insistence

that the freehold and the checking of aggregation were quite incompatible, the Government in 1905 appointed a Royal Commission to investigate the whole subject. The Commission journeyed up and down New Zealand hearing witnesses, but in spite of this was not able to reach any unanimity of opinion.

General Rise in Land Values

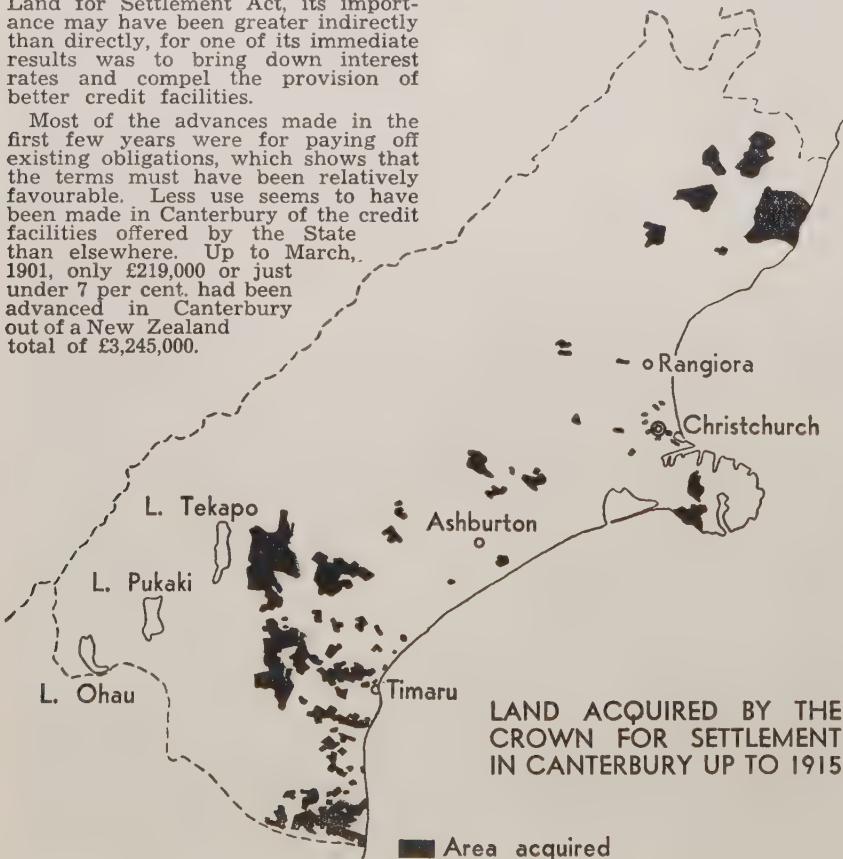
Though Canterbury witnesses were more evenly divided about the merits of freehold and leasehold than those in the north, the demand of many witnesses farming on estates recently purchased that the land be sold to them at cost price must have raised some doubts in the minds of the Government leaders. But the real reason for the Government's slowing down its purchases was the general rise in land values and the uncertainty whether large Government purchases were boosting them still further. This was bluntly stated by Sir Joseph Ward when introducing the Land and Income Tax Bill of 1907. "We are carrying on in the face of very high values of land the land purchase system. . . . It would be impossible for the Colony to go on borrowing and spending £750,000 a year . . . in order to acquire fresh land for settlement."

He also made it clear that the Government intended to place a great deal of reliance upon the steepening of the graduated land tax to bring about closer settlement. The earlier land tax had aroused the violent hostility of the large landowners, but it had not hurt any of them much and was indeed more important as a symbol than as an effective inducement to subdivision.

The same year, probably in the face of the growing pressure of the Farmers' Union, the Government's tenants were given the option of acquiring the freehold, while further grants of the "lease in perpetuity" ceased. This had few defenders, even some of the tenants disliking it, though they had little to complain of, as it favoured them in every way. As Condliffe suggests, their ideas were being more and more directed towards "farming for the property market", and the restrictions imposed by the leasehold checked speculative buying and selling.

Breaking up of Larger Properties

Like most other measures of the same kind, the effect of these changes, especially the stiffening of the land tax, is difficult to gauge. Sir Joseph Ward suggested to large property owners that they should sell off their land before it rose much more in value and the community felt impelled to impose even heavier charges upon it. A considerable amount of subdivision did go on in anticipation of the new tax and shortly after it was imposed, and some of the larger properties in Mid-Canterbury were broken up. Lagmor was sold off gradually from 1904, Winchmore was cut up and sold in 1905 for £15 10s. an acre, Maronan in 1906, The Terrace in 1907, Westfield in 1908, and Springfield in 1909. Much of Cameron's Springfield estate was sold for £19 an acre. Even though the Government found the Lands for Settlement programme difficult to carry on, large-scale purchases were



STATE PURCHASES OF LARGE ESTATES IN CANTERBURY



[From the Alexander Turnbull Library photographic collection.]

John McKenzie, whose name will always be linked with the Cheviot purchase and the breaking up of the large estates. From his boyhood in the Highlands he was passionately opposed to anyone holding land in large blocks.

resumed in Canterbury in 1909, when the Culverden estate was taken over after prolonged negotiations and court proceedings.

In the next few years buying was largely confined to South Canterbury and more and more attention was devoted to pastoral land in the foothills. Some 26,800 acres, part freehold and leasehold, of the Tripp estate were acquired in 1910; Sherwood Downs of 57,600 acres, again part freehold and leasehold, was bought in 1912, some 12,700 acres of Four Peaks the same year, and in 1913 Mt. Nessing of 34,800 acres and Ashhurst of 25,000 acres. Besides these there were several smaller agricultural properties, including Allanholme, Douglas, Timaunga, Claremont, Bourndale, Tara, and Landsdown. The changing circumstances in which the land was purchased were shown by the fact that the Government paid about £3 an acre for the Cheviot estate in 1893 and was compelled to pay £19 an acre for the Douglas estate at Waihao Downs in 1911. There would not be so much difference in the quality of the land.

Another striking trend, the shift in demand from agricultural to pastoral properties, was noted by the Land Purchase Inspector in 1912. He declared: "The invariable reason given by owners for seeking to dispose of their properties is the ever-increasing difficulty of obtaining adequate labour. While there is a scarcity of applicants for agricultural lands, the reverse is the case for grazing. As, for instance, for the Four Peaks settlement of an area of 12,692 acres subdivided into 8 sections there were 393 applicants, while for the Timaunga settlement of 5957 acres, mainly agricultural land of good quality, there were only 30. Both are in South Canterbury and both were offered the same day."

Up to 1914 the Government had purchased 369,000 acres in Canterbury,

excluding Cheviot, which shows how much the Canterbury scene was transformed and how important were the social effects.

There was some apprehension that the high price of land would prevent those of limited means from acquiring it at all, and occasionally it was alleged that large areas were still being bought up by the wealthy. In 1911 there were still 22 estates made up of rural land with an unimproved value of £50,000 or more, but this was probably a big reduction compared with a decade earlier.

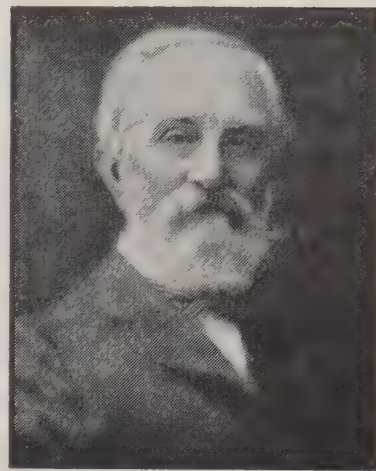
The Canterbury witnesses before the 1905 land tenure commission nearly all declared that they had made little use of the Advances for Settlers Department, and though it lent more later it did not seem to play a significant role in Canterbury farming up to 1914. With land values rising investment in farm mortgages was fairly secure and often fairly low deposits were required. For the farms sold off from Glenmark it was only 10 per cent.

STABLE 1900's

In retrospect the years between 1900 and 1914 seem unruffled and tranquil in every way, and even at the time it must have seemed as if a period of stability had arrived that would go on and on. Technical changes were few, changes in methods were equally few, and perhaps farmers were inclined to grow a little complacent. However, with steadily rising prices there was no great need for them to worry, and few of them did. The frozen-meat trade had long since got over its teething troubles, and the raising of meat for export had become the mainstay of Canterbury farming. The rise in overseas prices was by no means spectacular, and was interrupted at times, as in 1908-09, but the setbacks were not severe enough to disturb anyone.



C. H. Ensor, one of the Canterbury men who played an important part in the evolution of the Corriedale breed of sheep. He was a prominent member of the Canterbury Agricultural and Pastoral Association.



[From the Alexander Turnbull Library photographic collection.]

Sir John Hall, who was opposed to the compulsory acquisition of land by the Crown, but who knew that closer settlement must take place. He had a long association with national politics and was one of Canterbury's most progressive runholders.

As usual, wool prices fluctuated more than others and did not begin to progress steadily upward until 1910. Between 1900 and 1909 prices for half-bred wool ranged from 7½d. to 13d., but picked up to 15d. in 1911 and 1912. The rising wool prices brought about a demand for the process of subdivision to be extended to the high-country runs. Before the leases fell due in 1912 the Government appointed two commissions to examine the practicability of subdividing the high-country runs in the Mackenzie Country and Ashburton. One was the usual statutory commission consisting of two officers of the Department of Lands and Survey and a member of the Land Board; the other consisted of three men with experience in the high country.

The statutory commission in its report emphasised the danger of separating summer and winter country and also the need for the runholder to have sufficient resources to tide him over periods of heavy losses and low prices. The commission recommended that of 18 runs 8 might be divided in 2 and 2 into 3, making 30 in all. The second commission submitted two reports, one suggesting that 18 runs be divided into 25 and the second 38. The Mackenzie Country runs were eventually offered in 27 pastoral runs and 5 small grazing runs.

Opposition to Meat Grading

If the frozen-meat trade was the mainstay of Canterbury farming, it did not mean that meat producers were wholly satisfied with their lot. Britain was able to take all the meat offered, but in 1908 and 1909 the rise in prices slackened off and shipments of New Zealand produce always seemed to arrive on the London market when supplies were plentiful and cool stores

FARMING IN CANTERBURY . . .

full. Canterbury producers still gained a premium over their rivals, yet they feared that the margin might tend to narrow and all would be on a uniform level. Their opposition to compulsory Government grading in 1900 was based on this fear.

In 1901 prices for fat lambs on the Addington market ranged from 12s. 6d. to 14s. 6d., but by 1905 they were up to 17s., a price which must have caused much jubilation. The backwash of the world-wide depression in 1908 and 1909 was felt by 1910, when prices had dropped to between 9s. and 12s., but recovery was rapid then and in 1914 the price ranged from 15s. to £1. In 1910 the Canterbury Agricultural and Pastoral Association called a conference of meat producers, freezing companies, and exporters to discuss ways of improving the overseas marketing of New Zealand meat and to air grievances generally. No particular results came of the meeting, most of the discussion centring round a remit submitted by the Scargill branch of the Farmers' Union, which suggested that a farmers' co-operative company be established to consign and market all New Zealand's meat. The remit and the support given to it are interesting as foreshadowing some of the post-war marketing schemes.

The steady returns and steadily rising prices for dairy produce as well as the rapid advances made in dairying districts in the North Island led some Canterbury farmers to turn more to dairying, especially on the heavier land. The Department of Lands and Survey in its reports always gave an approving nod to any settlement which had started a creamery. Perhaps it was thought that regular milk cheques meant more secure rents. In spite of these exhortations, dairying remained of secondary importance, the number of dairy cows increasing from 36,000 in 1900 to 52,000 in 1910.

The wheat grower did not altogether share in the optimism of his fellows, though there would not be so many farmers after 1900 who depended entirely on wheat. Prices were not encouraging, rising from 2s. 4d. a bushel in 1900 to 4s. 2d. in 1903, dropping to 3s. 1d. in 1905, and picking up to 4s. 7½d. in 1908. From then until the outbreak of war prices ranged from 3s. 9d. to 4s. The South African war gave a boost to oats prices, but this could not be sustained for very long.

Difficulties of Wheat Grower

Shortages of labour and rising wages were held up as reasons for the wheat growers' difficulties. The progress of

closer settlement would have reduced the number of agricultural workers available, as all who could would have taken up land of their own. Between 1900 and 1914 secondary industries did not expand much, so they could not have denuded the countryside. In 1900 the usual wage for a farm labourer was about 20s. a week, with keep. By 1910 this had risen in some cases to 25s., but after that the rise was more rapid.

By 1914 the wheat grower was already beginning to think of some kind of assistance, the duties on wheat and flour, which had lasted from the 1870's, not being much help, but there was a strong prejudice against protective duties on food, and at that time there would not have been any agreement among the wheat farmers themselves.

As with many other things, the appearance of the country did not alter much between 1900 and 1914. More maturity, the rough corners gradually smoothed down, a succession of ploughed and grassy paddocks surrounded by gorse hedges, more plantations—all these were obvious. The countryside was pierced by quiet country roads often between high hedges and bumpy and badly surfaced by today's standards, and along them passed drays, spring carts, and gigs, with an occasional wagon and a traction engine; more rarely a noisy early-model motor-car spluttered along, a forerunner of the changes of the future.

Fruit Crop Estimates for November, 1950

THE following estimates of the fruit crop for November, 1950, in 000's of bushel cases, are provisional and revised monthly for the period November to March and are summarised from information supplied by field officers of the Horticulture Division, Department of Agriculture.

FRUIT	DISTRICT									
	Auckland	Gisborne	Hawkes Bay	Manawatu Wanganui	Waikarapa	Nelson	Marlborough	Canterbury North Otago	Central Otago	Total
APPLES—										
Ballarat	37	7	59	2	1	7	3	8	1	125
Cox's Orange Pippin	7	3	50	1	1	126	12	16	11	227
Delicious	11	8	80	2	4	152	24	18	40	339
Dougherty	19	4	50	—	—	23	1	—	—	97
Granny Smith	61	3	80	2	3	76	2	2	4	233
Gravenstein	17	—	30	—	—	53	1	1	1	103
Jonathan	7	—	40	—	1	242	24	12	32	358
Sturmer	1	5	150	5	16	334	26	48	32	617
Other varieties	77	5	124	3	6	139	20	48	46	468
Total	237	35	663	15	32	1152	113	153	167	2567
PEARS—										
Beurre Bosc	5	1	3	—	—	8	—	—	—	17
Louise Bonne de Jersey ..	—	—	15	—	—	—	—	—	1	16
Packham's Triumph	6	—	4	—	—	3	—	—	—	13
P. Barry	2	1	15	—	1	4	—	1	—	24
W. B. Chretien	7	—	50	—	—	34	—	2	8	101
Winter Cole	1	1	65	—	2	31	1	5	3	109
Winter Nelis	—	—	30	—	—	10	—	2	5	47
Other varieties	11	1	9	2	—	11	1	7	4	46
Total	32	4	191	2	3	101	2	17	21	373
OTHER FRUITS—										
Peaches	57	5	238	1	—	51	6	8	67	433
Apricots	—	—	4	—	—	1	—	11	130	146
Nectarines	—	—	20	—	—	1	1	—	18	40
Plums	31	5	51	1	1	16	2	10	30	147
Cherries	—	—	2	—	—	—	1	5	11	19
Quinces	1	—	8	—	—	9	—	—	1	19

CEREAL PRODUCTION

The change-over to a genuine system of mixed farming and the end of the "bonanza" farming did not take place suddenly. Though the first frozen-meat shipment had left Canterbury in 1883 and 10 years later more than 500,000 carcasses a year were being dispatched, wheat acreages were still very large in some years, the largest of all being in 1891-92 with 279,000. But the area in wheat had begun to fluctuate according to whether farmers directed their efforts toward cropping or fattening, and it was obvious that wheat exports would not again play the part they had in the late 1870's and early 1880's. The effects of the predatory system of "bonanza" farming were felt, however, for some time to come, for yields reached their lowest level in 1891-92, the year with the record area. For Canterbury it was only 23 bushels an acre. Compared with some of the reputed yields 20 or 30 years earlier, this was a very heavy decline.

The recovery following the adoption of a better system of crop rotation is apparent from the averages (for New Zealand) from the six 5-year periods 1890 to 1920:—

YIELDS OF WHEAT

Period	Bushels per acre
1890-91—1894-95	22.2
1895-96—1899-1900	26.9
1900-01—1904-05	32.9
1905-06—1909-10	29.9
1910-11—1914-15	29.4
1915-16—1919-20	26.7

The recovery, especially in the period 1900-03, is very marked, wheat over those years probably being grown on the most suitable land. The use of marginal land tended to bring yields down. By 1910 the trend toward

CEREAL PRODUCTION IN CANTERBURY

higher yields had come to an end, and a reduction began which by 1915-16 had brought the yield down to the level of the early 1890's. Careful systems of crop rotation were not sufficient to maintain fertility, weather may have been unseasonable, and the expansion of dairying had pushed wheat growing off some of the best land. Fluctuations in the acreage had a very marked effect on the yield, the extent of the fluctuations being shown clearly in the following table:—

AREA PLANTED TO WHEAT

Year	Acres
1890-91	212,000
1895-96	169,000
1900-01	147,000
1905-06	155,000
1910-11	230,000
1915-16	245,000
1920-21	171,000

The larger area in 1910-11 reflects the farmers' dissatisfaction with overseas meat prices; the increase in 1915-16 was probably the result of higher prices after the very low acreage the previous year. The stimulus of wartime shortages was not sufficient in itself, and in 1916 the Government offered a guaranteed price which ensured a reasonable level of production until 1919-20, when the area fell to 115,000 acres, the lowest for many years.

Varieties of Wheat

By 1900 the old Tuscan variety of wheat had been replaced by Solid Straw Tuscan, which was particularly suited to New Zealand's conditions because of its resistance to the threshing action of the wind. It almost certainly originated in one of the Mediterranean countries, and was introduced to New Zealand during the 1880's. It is probable that it is a cross between bread wheats and macaroni wheat.

Although Solid Straw Tuscan spread rapidly, it did not entirely replace Hunters, which, with a stronger straw, stood up better on the heavier land. Hunters was an early introduction, before 1860, from western Europe. By 1910 it had become very impure and was gradually replaced from 1915 by a pure line called College Hunters, selected at Lincoln College. This selection is important as being the first pure line of seed of any kind produced in New Zealand.

These two varieties, Solid Straw Tuscan for the greater part of the wheat-growing land of Canterbury and Hunters for the few pockets of very heavy land, admirably suited the requirements of the growers. New introductions were made from time to time (they had been made even before 1900), but few of these came to stay, and of the majority only the name, if that, remains today.

Among the more important is Jum-buck, a high-quality baking wheat brought to New Zealand about 1901, but its value as a high-quality spring wheat was not recognised until the 1920's. Dreadnought since 1909 has been important in a small area of very heavy land in Waimate, where its potentially high production is able to be expressed.

Velvet and Pearl, similar except for the velvet chaff of the former and the fact that the yield of the latter was

lower and the quality higher, were important in the early years of the century, but acreages in these two varieties rapidly decreased until they disappeared. Velvet was represented by less than 15 per cent. of the wheat acreages in 1920.

Other wheats which were important locally or for a short time only were Federation, Solid Straw Velvet, Hollow Straw Tuscan (the Tuscan before 1900), Sensation, Victor, Red Marvel, Bobs, Talavera (probably a pure selection of Solid Straw Tuscan), Bordier, Yandilla King, White Winter, New Era, and Duluth.

Pickling with bluestone was used to control ball smut, and later, about 1910, formalin was first used and became about equal in popularity with bluestone.

Oats

In the first decade of the century the area in oats ranged from about 150,000 to 200,000 acres, and from 1900 to about 1905 about two-thirds of the area was threshed and about one-third chaffed, the amount devoted to greenfeed being fairly small. Gradually the proportion devoted to chaff rose, and in 1910-11 the two areas were approximately equal, that for threshing being 112,000 acres and that for chaff about 100,000 acres. With the outbreak of war and the great increase in the Army's demand for horse feed, the proportion devoted to chaff rose to about two-thirds of the total (for 1916-17 oats for threshing totalled 82,000 acres and oats for chaff 159,000 acres).

Appreciable areas of oats have always been grown for greenfeed, averaging about 8000 acres per year, though the area has varied from year to year according to climatic conditions. The cereal greenfeed crop is one which fits in with the system of management on the Canterbury mixed

farm. The root crop for winter feed is somewhat unreliable, and particularly in a dry year a cereal crop, usually oats but sometimes black or cape barley, is grown as a supplement frequently after a wheat crop.

The varieties of oats before 1920 were White (Gartons), the main milling oats, usually spring sown, and Algerians (brown), Duns (grey), and Black Tartars, all grown for grazing, chaff, or threshing for feed. These varieties were usually autumn sown, as they stood the frost better than Gartons. For greenfeed (and most oat crops were expected to provide some spring feed before being shut for a crop) they recovered better after grazing and could be grazed more often than Gartons.

Barley

Barley usually occupied an area about a tenth that of the wheat crop, though there were years when it fell well below this. Up to the First World War the area was around the 10,000-acre mark, except for the years 1900 and 1909, when it was about 15,000. Then it dropped to about 6000 acres during 1914-18, when the main emphasis was on wheat growing. This was a crucial period in barley growing also, because yields were very low through barley growing being pushed on to the poorer land. Moreover, the best barley was taken for malting, and seed supplies had become mixed and of poor quality.

The main barley variety during this period was Webb's Kinver Chevallier, commonly called Chevallier. New varieties were introduced from time to time, but were discarded either because they were not suitable climatically or were of low malting quality. In 1919, 100 sacks each of two varieties, New Binder and Plumage, were sent out by Mackie and Co. of Glasgow. These were auctioned in 5-sack



[From the Alexander Turnbull Library photographic collection. Timaru harbour about 1910. From this port large quantities of meat were exported after the breakwater was constructed.

TREE PLANTING ON THE PLAINS . . .

lots and the proceeds given to hospitals. New Binder proved unsuited to the conditions and went out of cultivation. Plumage, on the other hand, was a good yielder, and as it was a pure line and free from smut at the time, it was grown extensively until it was supplanted by newer varieties.

After 1920 Spratt-Archer and later Plumage-Archer were introduced. From 1919 the Canterbury Seed Company, for whom much of the barley was grown under contract, was responsible for the careful selection of seed lines. Manuring with about 1cwt. of superphosphate per acre became more common from 1900.

Pickling of seed barley in bluestone was carried out from 1890, though it affected the yield and the value of the produce. It was not until 1924 that the "hot water treatment" for covered smut and loose smut was applied to seed distributed to selected growers by the Canterbury Seed Company.

AFFORESTATION

In many accounts of the early days of settlement it is recorded that on their first sight of the Canterbury Plains the early arrivals almost always remarked on the lack of woods in their new country. They must have made early plans to begin planting round their farms and homesteads, and to endeavour to create a little of the atmosphere they had left. The French settlers at Akaroa landed in one of the few places in Canterbury that were well covered with native bush, but they planted fruit and walnut groves and avenues, some of which persist to this day.

As the Pilgrims and their successors spread over the plains the absence of timber often caused them a great deal of extra work, and what few patches of bush could be found were soon cut out. The winds from both the north and the south made everyone long for some kind of shelter and also made the task of keeping mobs of sheep under control most difficult.

Like many other things in Canterbury farming, the first tree planting

on the plains was done by the Deans brothers; their example was soon followed by other pioneer settlers, the first trees to be planted being poplars and willows. The willows at Akaroa were supposed to have come from St. Helena. In the diary of St. Leonard's Station in 1855 there is an entry in July: "Planted 130 poplars and willows", and in October: "Sowed seed of bluegum, broom and berries [probably hawthorn for hedges]". An October entry a year later is "sowing the 'oak' seed".

Runholders needed timber for many purposes, and though those cutting native bush had to obtain a Crown timber licence, fires and wasteful methods soon reduced the limited areas and prompted the Provincial Council to consider ways of encouraging further planting. John Hall of The Terrace Station brought the matter up in the Provincial Council during 1856, when he had already embarked on an extensive programme on his own land. A plantation was considered as a qualification for a "pre-emptive right", and was regarded by the Waste Land Board as an improvement, but though this may have encouraged some planting, there were cheaper ways in which "pre-emptives" could be claimed. The Provincial Council also endeavoured to encourage tree planting on the smaller leased estates, but did not receive much response.

Establishment of New Plantations

From 1860 to 1870 tree planting was carried on extensively, especially in the areas between the Rakaia and the Ashburton Rivers and the newly opened land around Timaru. "Burning off" the tussock was responsible for the destruction of much bush in the foothills, causing the Government some concern about the amount of timber lost. The Chief Surveyor recommended that it would be better to establish new plantations than to try to conserve the native bush. This in turn produced the problem of the best kinds of trees to plant, and this question, along with the Chief Surveyor's suggestion, was considered by a Provincial Committee to inquire into new

industries which met in 1870. It recommended that land grants should be made to people prepared to carry on tree-planting experiments.

This resulted in the passing by the central Government in 1871 of the Forest Trees Planting Encouragement Act, by which 2 acres of rural land were granted to farmers for every acre of freehold land successfully established, no grant being given for fewer than 20 or for more than 250 acres. The "bonanza" wheat farms that were just beginning at this time suffered badly from the north-west gales, which often blew both soil and seed away. Extensive systems of trees as windbreaks were shown to be necessary, and their formation was successfully encouraged by this Act. Large areas were being set aside for plantations by road boards, and in 1879 public bodies received the same benefits as private planters in land grants. These enactments greatly encouraged tree planting by public bodies which had large reserves and which to pay for any planting done leased out land they were not ready to plant.

At this time 32,000 acres of Crown land were set aside for plantation purposes, chiefly in Ashburton, Selwyn, and Mackenzie Counties, and by 1902 the areas planted covered 10,500 acres. The formation of these plantations during the next 20 years greatly changed the appearance of the country, and they became a very valuable asset to the province. That the necessary conditions for such grants were strictly enforced may be gathered from old Department of Lands and Survey files, which contain instructions to inspectors to reject any part of the plantation where trees had failed.

Early Choice of Species

Tree planting in Canterbury passed through three stages. The settler first planted an orchard and then sowed hawthorn or gorse for hedges and European species of trees—willows and poplars or oaks and later elm, ash, and maple. Most of the nursery stock was imported from Australia. The Deanses had seed sent from Scotland and in one letter John Deans told his father that he intended to plant trees for shelter and ornament "as soon as we can raise the plants in our ground". Records of planting on their Homebush run were kept from the beginning.

Odd references are found from the early years of settlement to seed of bluegums, white gums, and other species brought in or sent from Australia, and the first bluegum to be planted about 1860 at Temuka was reported to have been grown from seed brought in the waistcoat pocket of an Australian miner.

The European trees proved slow growers, but the rapidity of the eucalyptus trees grown from the imported seed became widely known, and Australian species formed the next choice for planting—bluegum (*Eucalyptus globulus*), stringy bark (probably *Eucalyptus obliqua*), acacias, chiefly *Acacia dealbata*, and she-oak or casuarina species. About 1860 George Rhodes himself planted an avenue of bluegums at the entrance to Levels Station.



The homestead on Mt. Peel Station before 1900. On this estate J. B. A. Acland began planting in 1859, 3 years after he had taken up the run.



The Mid-Canterbury plains, showing the modern extensive system of shelter belts and the Rangitata deviation channel. [Whites Aviation Ltd. photo.]

This eucalyptus phase was gradually merged with the growing of evergreen trees, which started with the importation in the 1860's of potted plants of American species, pines, and cypresses. It is not known exactly where the first *Pinus radiata*, then known as *Pinus insignis*, was planted, but it is certain that some *Pinus insignis* planted by J. B. A. Acland at Mt. Peel Station were imported from Sydney in 1863 at a cost of 4s. 6d. for each plant. *Cupressus macrocarpa* must have been planted by one of the Rhodes family about this time too, for by 1867 a macrocarpa tree at Purau was 10ft. high. In the same year Robert Rhodes left Purau and built a new home at "Elmwood", Christchurch, "where he introduced 12 varieties of conifers from San Francisco, few of which had previously been seen in New Zealand".

Species in Private Planting

On the foothills of Canterbury Acland started in 1859 to plant his homestead at Mt. Peel, using seed or plants imported from Veitch's nursery at Exeter, England, and in this

year it is recorded that one seedling of Douglas fir (now known better as Oregon pine or *Pseudotsuga taxifolia*) was imported and thrived, but that seedlings of *Sequoia wellingtonia* died on the voyage out. During the 1860's seeds or plants of the following species were imported from England by Acland: *Picea* (spruces), *Cedrus*, *Cupressus lawsoniana*, junipers, *Abies*, *Pinus*, and Californian redwood. A deodar planted at Mt. Peel Station produced fertile seed at 28 years of age.

One of the early farmers who started extensive planting on the dry, shingly, poor soils characteristic of much of the plains was T. W. Adams. His plantations at Greendale were 500ft. above sea level, and there from about 1865 he experimented with the planting of many timber-producing trees from temperate regions. In 1905 he was reported to have 1000 species or varieties established; these included 48 species of oak and 50 species of pine.

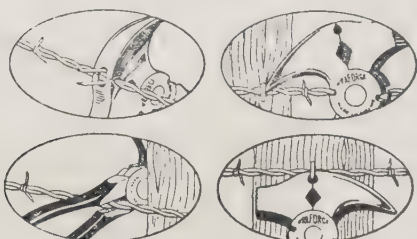
One of the most closely planted areas in Canterbury is that around Winchester, which was originally planted as part of the Orari run in

the 1870's with acacias and willows on the river-bank, but in reporting on this planting in 1874 the "Timaru Herald" said that they "looked quite pretty", but wished that the "villagers would plant pines instead of gums and acacias". This wish was amply fulfilled, in 1880, when the Winchester Domain was planted with an excellent mixture of evergreen and broadleaf species, which forms today a splendid memorial to the "town fathers" of that day.

Plantings by Public Bodies

The species planted generally in Canterbury by public bodies between 1870 and 1900 were mainly the same kinds, varied slightly according to locality and period. The Waimakariri River reserves were started with willows and poplars in 1869 and continued with the use of English trees (oak and birch), *Pinus radiata*, *Pinus sylvestris*, *Pinus pinaster*, and spruce. Ashburton plantations were started in 1870 with *Pinus radiata*, *Eucalyptus globulus*, and oak, and added later were *Pinus laricio*, *Pinus ponderosa*, and spruce. Selwyn plantations were

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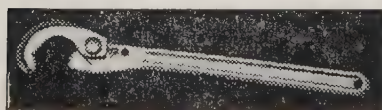
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AUCKLAND

AFFORESTATION IN CANTERBURY

started about 1885 with *Pinus radiata* and various eucalyptus species, together with small areas of larch, Douglas fir, *Pinus laricio*, oak, and the ubiquitous spruce. The first of the railway plantations were started in 1885 at Weedons with oak, then English beech was added, but did not survive, and later areas were tried of larch, *Pinus laricio*, *Eucalyptus globulus* and *Eucalyptus erostrata*, *Pinus ponderosa*, *Pinus pinaster*, *Acacia dealbata*, and cypresses.

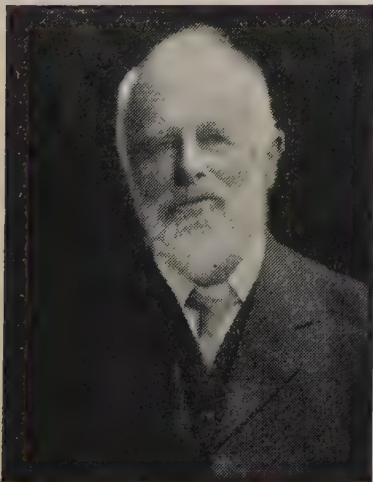
Larch and oak were widely used, and eucalyptus and the pines came in to replace slow English trees. Norway spruce was a complete failure, and Oregon pine was used more in the plantings made toward the end of the century. Of the different kinds of trees tried on the dry plains of Canterbury five have proved their worth: *Pinus radiata*, *Pinus laricio*, *Pinus ponderosa*, Oregon, and some cypresses. Eucalyptus trees have suffered badly from both frost and epidemic insect attacks; the climatic conditions are generally unsuitable for spruce, which becomes a victim of the spruce aphid.

Early Nurserymen

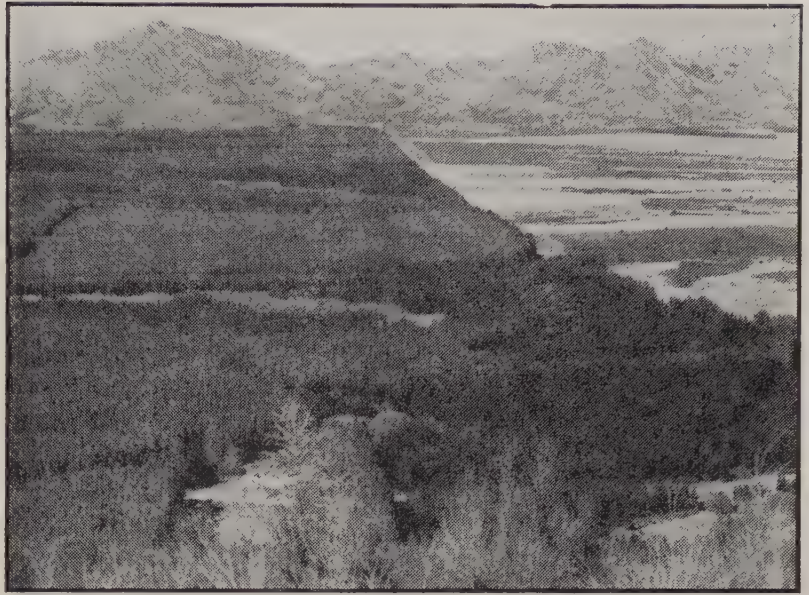
The nursery stocks for the first plantings were imported into New Zealand, but it was not many years before raising this material became a commercial undertaking. William Wilson was apparently the first nurseryman in Canterbury, and there is a description written in 1863 of 19 acres of his nurseries on land which is now part of Christchurch City; he evidently raised many of the various species of trees tried in the early plantations. In 1879 Nairn's nursery was established on land near Lincoln, and Millechamps started growing and planting trees on contract at the beginning of this century.

Planting Methods

Tree-planting operations in early days formed an important part of the run routine and were carried out as



T. W. Adams, who began tree planting at Greendale in 1865 and who over a period of 50 years experimented with different species to find the most suitable for the dry, windy plains.



[New Zealand Forest Service photo.]

The establishment of these plantations at Hanmer was begun about 50 years ago.

nearly as possible in the way that the work had been done in Britain. At St. Leonard's Station Duppa drew up routine farming instructions in which directions were given about the season to plant trees (July) and to sow (October).

In preparation for planting, the land was ploughed and fallowed and often a crop of turnips was taken off; the trees were then arranged so that a plough could be used for cultivating between the rows.

Seed of eucalyptus was usually drilled directly into the ground to form plantations, and Adams describes how in 1891 he drilled seed of gums, wattles, and *Cupressus macrocarpa*, which had been mixed with damp sand for some days previously, to form a plantation. The usual method was to broadcast seed at the rate of 2½ oz. per acre and to harrow it in.

When the Crown reserves were first marked out they were often laid off running in the same direction as the main winds, but when it was realised that they could be utilised for shelter belts they were usually laid out at right-angles to the north-west or south-west winds. Sometimes these reserves were a mile or two long and 10 or 11 chains wide, with trees spaced 10ft. apart, and gradually they formed a network over the country, especially in the flat, windy areas of the Ashburton Plain and in the vicinity of the Rakaia Gorge. When belts were planted by runholders or farmers they were often placed as a series of parallel belts, sometimes ½ mile apart; later the plan was often adopted of joining two belts at right-angles to provide shelter from both prevailing winds, and this arrangement is shown in the plan of shelter belts planted over a period of 50 years by John Hall on The Terrace Station.

Private belts were only 1 or 2 chains wide, with rows and trees spaced 9ft. apart, and on The Terrace Station at least the custom was to leave in the long belts gaps 1 or 2 chains wide which were grazed so that fires would not travel the whole length.

Care of Plantations

The story of one old belt planted on part of the old Mt. Hutt Station on the banks of the Rakaia River is typical of the thorough and costly methods used in 1870-80. This belt was planted north-east to south-west along an upper terrace of the river in 8 rows of *Pinus radiata* trees with 9ft. between rows and 6ft. between trees. No thinning was done, and yet there were very few failures in spite of the intensity of the north-west gales.

MIGRATION TO THE NORTH

Two motives probably inspired the men who left Canterbury for the north from the 1880's onward. On the one hand they hoped to put into practice the farming methods which had proved successful in Canterbury; on the other hand the almost complete occupation of the province compelled those who wanted land to look elsewhere. During the long depression of the 1880's economic necessity caused large numbers of people to leave Canterbury, and many of those who were prepared to face the hardships and uncertainties of taking up land in the bush left for the north.

This steady exodus caused much concern among Canterbury people. A member of Parliament declared in 1892 that the province had suffered a greater loss of the young and the able than any other part of New Zealand, but until the larger estates were broken up the opportunities for those remaining at home were limited. Commenting on the Cheviot purchase,

FARMING IN CANTERBURY . . .

the Christchurch correspondent of the "New Zealand Farmer" declared: "It is better to buy a bit of Cheviot land than to take up bush land in the North Island as so many Canterbury men have been doing lately and are still doing." From then on there were certainly more chances at home, but the movement north did not cease.

"Bonanza" Farms in Auckland

Parts of Auckland Province attracted those with capital to invest. Some of Auckland's open, ploughable lands bore a superficial resemblance to those in Canterbury, but the resemblance was in vegetation—tussock plains and manuka downs—rather than in the quality of soil, for Auckland's clays, sands, and silts could not compare with the Canterbury Plains in fertility. Nonetheless, many people thought they did, and there were "bonanza" wheat and sheep stations in the Thames valley and pastoral leaseholds on the Taupo plains. However, the grand Auckland ventures all failed, the large arable farms for want of fertiliser and the sheep runs because of sheep sickness attributed vaguely to "want of salt".

The relationship between the establishment of permanent pastures on the Auckland waste lands and the Canterbury cultivation techniques appears

to have been fully grasped first by an Ashburton merchant, Hugo Friedlander. In 1906 he acquired 6000 acres of gumland scrub on Manakau Harbour to convert into a grassland estate for closer settlement. Joseph Batty, an experienced Canterbury farmer from Methven, was appointed manager, and he proceeded to Drury, south of Auckland, with seven 4-horse teams and began operations. The light scrub was burnt off and cut with scrub mowers and later the land was ploughed up. When it was worked down it was sown with oats, then with swedes or rape, and then with ryegrass or clover. Each crop, including grass, was manured, usually with a mixture of superphosphate and bone-dust, but preferably with basic slag (3cwt. per acre) for grass.

In 1911, after 4 years' work, Batty had established 3000 acres of ryegrass and clover pasture on which ran 8000 sheep and 350 cattle. The transformation of this waste gumland created much interest and when the first sections were sold the demand was keen among young farmers in the district.

Friedlander was only one among a number of Canterbury men who were turning their attention to the north. "Of late years", commented the "New Zealand Farmer" in August, 1911, "the lower price of the second-class land in

the Auckland Province has induced many South Island farmers to turn their attention to the north, and invariably they have secured considerable areas which they are handling in most cases in a very businesslike manner". The Tokoroa plain was particularly attractive to South Islanders not only because a railway ran right through it but because it was easy, rolling, "tussock" country. Many experienced Canterbury men took up land, endeavoured to improve it, but nearly all their attempts ended in failure, for the sheep just pined away and died. It was not until the 1930's, with the discovery of a means to combat "bush sickness", that any real progress was made.

Acknowledgment

Acknowledgment is made to the Canterbury A. and P. Association and Canterbury University College for the loan of photographs reproduced in this article.

Proceedings of Ruakura Farmers' Conference

PRACTICAL recommendations of experts engaged in agricultural research are presented in concise and clear form in the "Proceedings of the Ruakura Farmers' Conference Week, 1950," published by the New Zealand Department of Agriculture. The volume, which is of over 230 pages, is a complete record of the papers and discussions on them at the conference. Dr. C. P. McMeekan, Superintendent, Ruakura Animal Research Station, directed the proceedings, which were run in co-operation with the Waikato Farmers' Educational Committee.

The language of the layman has been used throughout and the papers have a down-to-earth quality which will appeal to all farmers, not only for this reason but also because they will find practically all modern farming problems dealt with frankly and realistically with sound suggestions and recommendations given which cannot but improve their own farming standards. This is not to suggest that papers were dogmatic; often they tended to be controversial and stimulating, as can readily be gauged from the lively discussions appended to the addresses concerned.

Though primarily a record of the results of experimental work at Ruakura, the subjects before the conference covered a much wider field. As instances, Professor G. S. Peren, Mr. E. Bruce Levy, and Professor W. R. Riddett made valuable contributions on the broader scale, while Messrs. I. L. Elliott and F. B. Thompson, Rukuhia Soil Research Station, gave information on the latest developments in research on regenerating peat lands of the Waikato.

The book is available at 10s. a copy from the Ruakura Animal Research Station or from Publications Section, Department of Agriculture, Box 3004, Wellington.

BOOK REVIEW

Introduced Mammals of New Zealand: K. A. Wodzicki

FORTUNATELY not every farmer will find this book of direct and pertinent interest to his farm management, for there are some so located and capable of so managing their farms that they suffer no damage and little danger from rabbits, deer, opossums, or any other animal dealt with except the ubiquitous rat and mouse. The more fortunate pest-free farmers, however, should be just as interested to know accurately the habits, the history, and the distribution of farming pests as their more troubled brethren. The maps are of absorbing interest, for they are the first attempt ever made to record cartographically the distribution of the major pests and the varying intensity of their present occurrence.

The reader will sometimes find that areas which he from past experience knew to be pest infested are shown as free or as but lightly infested. He will find perhaps more often that areas which 20 years ago were free of one or other animal are now heavily infested, or lightly infested, and so probably on the way to subsequent heavier infestation. Studying the maps and drawing on his own experience, he will begin to realise that all animals move not as individuals or even as pairs, but as populations; and if the author has succeeded in making clear this main purpose in preparing the book, some readers at least will grasp the new technique. They will not deliver judgment on the basis of the book's freedom from natural history anecdotes, its failure to prescribe methods of pest

annihilation, its impartial abstention from criticism of past actions either of men or of administrations. "The approach usually involves investigation of the habits of an animal society or population as a whole, as contrasted with the older method of observing individual animals" (p. 241).

Not the least merit of the book is that it teaches the method by example rather than by precept. One short factual introductory chapter of 18 pages and one concluding chapter of 3 pages contain the only personal views in the book. The rest is facts as narrated by scores of observers; all are scrupulously credited to their sponsors and all are assembled, summarised, analysed both geographically and historically, tabulated, or graphed. Yet this assemblage and analysis of bald facts are welded into a readable narrative, pleasingly illustrated, without loss of scientific order or cohesion.

If future administrative control measures of wild animals are carefully and progressively based on scientific work as carefully conducted and as fairly, impartially, and pleasingly presented as has been done in this book, the seeming chaos that prevails at present in New Zealand's feral animal picture will gradually but surely be reduced to order, and that order will remove one item from the list of the present worries of many farmers.

—C.M.S.

Bulletin No. 98 of the Department of Scientific and Industrial Research, Wellington, New Zealand. Price 12s. 6d.

Oscillating Cultivator

By S. FREW, Orchard Instructor,
Department of Agriculture,
Blenheim.

THE elimination of as much hand work on crops as possible has been the aim of farmers generally and market gardeners in particular for many years. This article describes a new type of cultivating machine which has been invented and developed in Blenheim and its design should be of interest to farmers with small holdings, especially growers of market garden crops, tobacco, small fruits, and other row crops.

THE inventor of this new machine aimed at designing something which would more closely resemble the action of hand hoeing, particularly the use of the push hoe, than would other types of cultivators. His main object at present has been to construct a machine which would supplant hand weeding and hoeing and which would be light and strong, easily handled, and cheap to run. In effect he has concentrated upon the kind of machine a market gardener, seed grower, or small fruit grower would require. This power hoe, however, is not a tractor or general field machine, but has been made chiefly for light cultivation and inter-row work on properly prepared soil, taking the place of operations previously performed by hand.

Oscillating Principle

The feature of this machine is the application of the principle of oscillation to a cultivating implement. There is a lateral and semi-rotary movement of the cultivating blades while the machine is moving across the

ground, whereas in orthodox cultivators or discs the blades have a rolling action or are stationary.

With the new cultivator the oscillating principle has been developed to the extent of providing a 45-degree movement from central pivots to two blades each 12in. long and 5in. wide at their widest point. The blades are attached to the chassis by vertical driving shafts and are set horizontally at any required depth. Moving at high speed, they thoroughly pulverise the ground and destroy any weed growth with ease.

The vibratory effect of the oscillation effectively throws off fibre and weeds which might tend to collect around the blades.

Cultivating Blades

The standard-type blade supplied with the machine is a triangular steel blade with three cutting edges, the semi-rotary action bringing all the

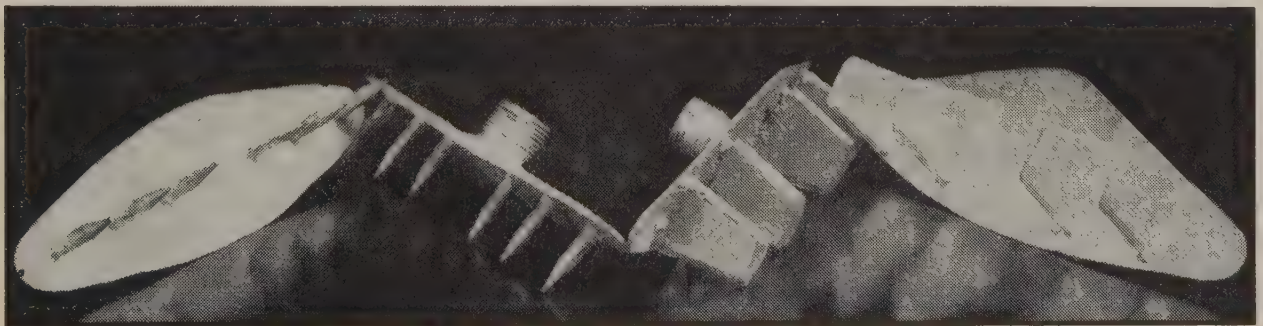
edges into play. It does weeding and cultivation effectively and is designed primarily for shallow cultivation and weed cutting. It can be set at a depth of from 3 to 6in. according to the state of the ground or the number of runs made.

Variations of this simple type of blade have been developed, however, enabling a more comprehensive range of cultivation to be done. A row of harrow spikes inset into the lower face of the blade converted the plain push-hoe action into a combined hoe-and-rake type of cultivation; a substitution of flanged blades for harrow spikes provided an implement which would thoroughly cultivate the ground in depth. With the three types of attachment now available effective cultivation for any purpose can be attained.

The cultivating blades are not only adjustable for depth, but can be moved sideways and set to overlap or spaced to leave untouched a strip of varying width between them. Thus, with rows of young seedling plants, for example,



The oscillating cultivator in operation on an area of tomatoes.



Alternative types of cultivating blades.

OSCILLATING CULTIVATOR FOR MARKET GARDENS



Fig. 1—Close-up view of implement guards attached to protect plants. Fig. 2—Machine in operation with guards attached. Fig. 3—Depth guards and general-purpose blades. Fig. 4—Mower attachment on swivel, which allows for undulations in the ground. Fig. 5—Working in tomatoes; the machine cultivates a 2ft. strip. Fig. 6—Shield used when working among tomatoes.

the machine can straddle the row and the cultivators can work on each side of the plants, leaving them undisturbed.

Cultivator Guards

In addition to the design of the cultivating blades, this machine has several other new features. For the cultivation of young seedlings by the method already referred to implement guards are accessory equipment (see illustration on opposite page). These not only protect plants from the moving blades, but serve as a guide to the operator in keeping the machine on the row and allow cultivation to be done very close to the crop.

For inter-row cultivation in small-fruit plantations a large protective guard is provided. It completely encloses the working parts of the machine and permits working in the row even where a straggling crop such as dwarf tomatoes may partially obscure the ground to be cultivated.

Depth guards are also provided to regulate the depth the blades go into the ground.

Power Unit

The power unit is a 1 h.p. 4-stroke engine, and a 2-speed drive to the gear box is provided to enable light or heavy work to be undertaken to best advantage. The power drive to both the wheels and the gearbox can be disconnected by a hand clutch on the handle bars. The throttle is also situated on the handle bars and is literally a finger-tip control. The driving shafts or spindles which operate the cultivating blades are set inside support tubes which remain stationary, and the use of a special taper grip enables the entire cutter and spindle to be removed with ease and rapidity. The blades are attached to the spindles by a nut and may be quickly fitted and removed with a special tool.

Chassis

Strength, durability, and lightness are keystones of the chassis. Mounted on 24in. all-steel cleated wheels, the framework also is constructed of steel and the handles and handle bars are of

PERFORMANCE OF OSCILLATING CULTIVATOR



This illustration shows how the wheels and handles can be adjusted for special work.

tube steel and have provision for height and sideways adjustment, the latter being an advantage when it is desired to operate the machine from the side. This increases its effectiveness and makes it easy to manipulate in confined spaces, such as in glass-houses. Being well balanced and light, it is capable of being turned in its own length with the cultivating blades still operating at working depth.

General Performance

Farmers in the Blenheim district who are using this machine all seem very satisfied with its performance. Although the vibration of the oscillating blades is not violent, it takes a little time to become accustomed to it. The manoeuvrability and good balance of the implement help to make it easy and pleasant to work. Its capabilities are well illustrated by the work it has done on one market garden where 5

acres of beans were thoroughly cultivated in 1½ days, using 1½ gallons of petrol per day. The machine operates at a slow walking pace—1 to 2½ miles per hour.

A special feature of the oscillating cutter appears to be its ability to do rugged work. With the ordinary flat cutter it has been found capable of cleaning up gravel paths, drives, etc., the cutters shearing off the weeds and leaving the metal more or less undisturbed.

A normal blade setting with no overlaps will cultivate a strip 2ft. wide at a time, and as the adjustable wheels of the machine can be set at less than this distance, it is practicable fully to cultivate a strip wider than the machine itself.

Additional Attachments

To provide an all-purpose machine the makers have extended the range of attachments to include common cultivating tools and accessories. A potato moulder, plough, harrows, discs, spray pump, and finger mower are some of the implements which can be readily attached and operated by the machine. A bracket is provided for the attachment of mechanical planting gear. A power take-off for light work is also included, and a tube or post is incorporated to be used as a stand for such purposes and for the attachment of the different implements.

Future Development

At present only the light machine described is under construction, but there appears to be no reason why the principle should not be applied to heavier machinery and worked from a power take-off as is done with other types of cultivating equipment. No doubt the demand for the present machine will determine the trend of future development.



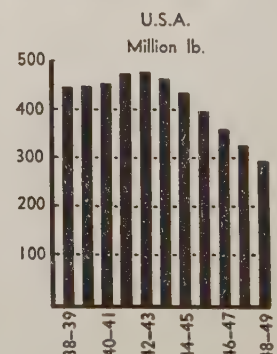
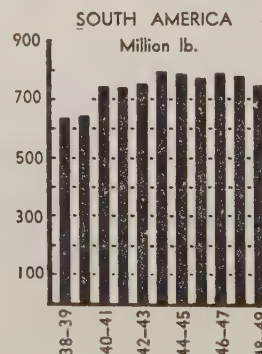
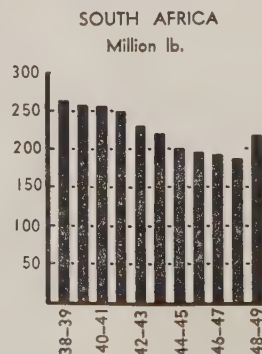
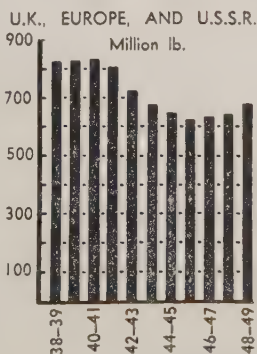
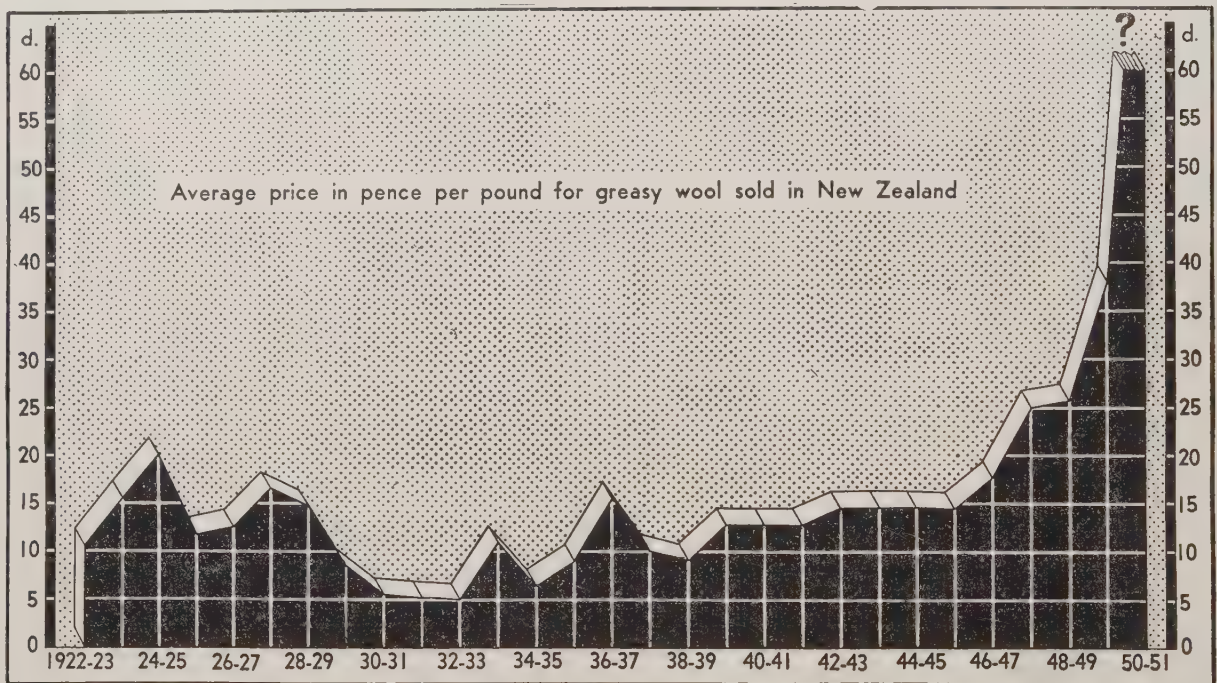
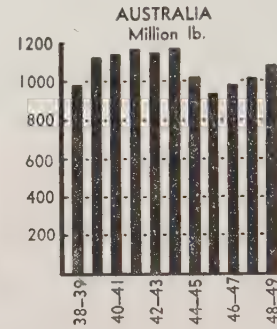
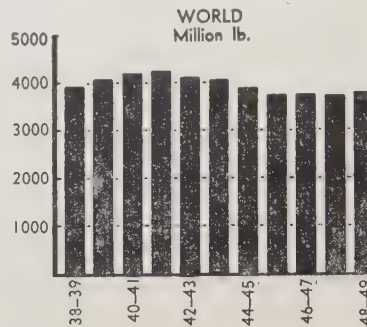
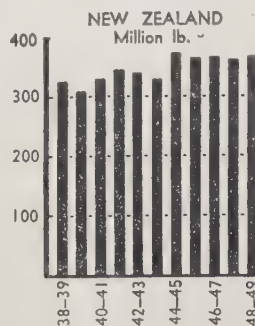
The oscillating cultivator can work against a wall.

PRIMARY PRODUCTION REVIEW

Wool

From data supplied by the Statistical Section, Extension Division, Department of Agriculture, Wellington.

Average prices of greasy wool sold in New Zealand each year since 1922-23 and estimates of wool production since 1938-39 in the main producing regions are shown below.



Sources: Commonwealth Economic Committee data, Dalgety's Annual Wool Review, and Census and Statistics Department statistics.

CHECKING EFFICIENCY OF MILKING MACHINES

CONSIDERABLE interest has been aroused in the trial service introduced by the Dairy Division for checking the efficiency of milking machines. This preliminary report by W. G. Batt, Supervisor of Dominion Farm Dairy Instruction, Department of Agriculture, Hamilton, who has inaugurated and supervised the trials, summarises results of the survey and comments on the findings.

AS a result of remits passed by some of its branches, the executive of Federated Farmers of New Zealand sought the opinion of the Dairy Division as to the possibility of the Farm Dairy Instruction service being extended to include some checking of milking machines and advising farmers as to the efficiency of working parts.

In consequence a trial service has been inaugurated in the Te Awamutu and Thames districts in co-operation with Federated Farmers. The keen interest displayed and the assistance freely given by local branches of Federated Farmers and by individual farmers included in the trials have assisted materially in conducting the survey.

A total of 50 machines in each district has been checked in rotation in two areas selected at random and this has provided some valuable data from what can be considered a cross-section of milking machines in use in large dairying districts. The farmers concerned are now having the recommended improvements carried out and the results will provide information as to the extent the efficiency of milking machines in use can be improved by recommendations made from the readings of modern instruments, and assist in the determination of policy in regard to the possible extension of such a service to other districts.

The technical instruments and the standards with which the readings of the instruments have been compared have been suggested by W. G. Whittleston, Physical Chemist, Department of Agriculture Animal Research Station, Ruakura, whose research has made possible an accurate measurement of reserves and capacities so essential to efficient machine milking.

The work carried out has included the measurement of the air reserve of the milking machine and checking the fittings for possible air leaks; the measurement of the capacity of vacuum pumps in relation to the number of teat-cups employed and checking the speed and efficiency of vacuum pumps; checking the accuracy of vacuum gauges and relief valves, and an examination of the condition of other component parts which have a bearing on the efficiency of the machine in providing a satisfactory milking action.

Tables 1, 2, and 3 indicate the working condition of the 50 machines checked in each of the two districts. The final column shows the percentages of parts found inefficient in the 100 machines, an aggregate of the two selected areas.

As the checks were carried out on 50 consecutive machines in operation in two areas selected at random inside two typical dairying districts, the

results can probably be considered a fairly accurate indication of the working condition of the average milking machine throughout the Dominion. In such case the figures draw pointed attention to the need for more consideration to this section of farm dairying, and perhaps a more frequent and up-to-date servicing of the machines in use.

It will be noted from the tables that only 23 per cent. of the machines checked had air reserves up to the standard set. The remaining 77 per cent. was from 1 to 16 cubic feet of air per minute under the accepted and recommended standard, and 10 per cent. of this figure had no reserve whatever.

Vacuum pumps and relief valves are important fundamentals in providing sufficient reserves to give satisfactory machine milking, and the tables show that a far-too-high percentage is either inefficient or under capacity. The reserve capacities of vacuum pumps, for instance, have been considered under three headings: 1. Capacity in relation to the number of teat-cups employed. 2. Under capacity by reason of inefficiency, wear and tear, and long usage. 3. Under capacity by being operated at insufficient speed. The percentages under standard in these three groups are shown, but it will be noted that no less than 70 per cent. was found to be under capacity in respect of the combination of the three contributing causes listed.

The relief valve was found to be unsatisfactory in operation because of corrosion and wear and tear in 38 per cent. of the machines checked, and as this component is a most important unit in machine efficiency, it appears to have had too little consideration and attention.

TABLE 1—PERCENTAGES OF IMPORTANT FINDINGS IN TE AWAMUTU AND THAMES AREAS: 100 MACHINES

	TE AWAMUTU				THAMES				TOTALS									
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.						
Machines up to standard concerning reserve air capacity ..			11	22			12	24				23						
Vacuum pumps under capacity because of—																		
Inefficiency	16	32	37	74	13	26	33	66	29	70								
Type of machine or number of cups employed	7	14			7	14			14									
Insufficient speed	14	28			13	26			27									
Vacuum pumps considerably over-speed			—	—			1	2				1						
Milking machines with no air reserve	5	10	39	78	5	10	38	76	10	77								
Milking machines with air reserve under standard	34	68			33	66			67									
Vacuum gauges inaccurate—																		
Under 1in. of error	17	34	31	62	1	2	20	40	18	51								
1in. to 3in. of error	14	28			19	38			33									
Relief valves of unsuitable type or unsatisfactory condition			16	32			22	44				38						
Machines with air leaks			33	66			26	52				59						
Pulsators set at incorrect ratios, irregular or too fast			5	10			8	16				13						
Pulsators leaking			2	4			—	—				2						
Releaser pulsators at incorrect ratios			1	2			7	14				8						
Unsatisfactory and sagging piping or fittings affecting free flow			2	4			8	16				10						
Perished metal			—	—			1	2				1						
Perished rubber			6	12			22	44				28						
Vacuum gauges varying from standard by																		
			Under 1in.	1in.	1½in.	2in.	Under 1in.	1in.	1½in.	2in.	2½in.	3in.						
			34%	16%	6%	6%	2%	26%	4%	4%	2%	2%	18%	21%	5%	5%	1%	1%

EFFICIENCY OF MILKING MACHINES . . .

TABLE 2—VACUUM PUMP RESERVE CAPACITIES MEASURED BY CUBIC FEET PER MINUTE: 100 MACHINES

	TE AWAMUTU		THAMES		TOTAL	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Satisfactory reserve capacity in relation to machine air consumption ..	13	26	17	34	30	30
Vacuum pumps under standard by—						
C.f.m.						
1	4	8	1	2	5	5
2	6	12	1	2	7	7
3	2	4	4	8	6	6
4	4	8	6	12	10	10
5	2	4	4	8	6	6
6	6	12	4	8	10	10
7	3	6	3	6	6	6
8	4	8	2	4	6	6
9	1	2	2	4	3	3
10	1	2	3	6	4	4
11	1	2	—	—	1	1
12	—	—	3	6	3	3
13	1	2	—	—	1	1
14	1	2	—	—	1	1
16	1	2	—	—	1	1

Note: Five vacuum pumps were considerably over standard in reserve capacities, including one operating at considerable over-speed.

TABLE 3—MACHINE AIR RESERVES MEASURED BY CUBIC FEET PER MINUTE: 100 MACHINES

	TE AWAMUTU		THAMES		TOTAL	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Reserve capacity up to standard ..	11	22	12	24	23	23
Machines with no reserve ..	5	10	5	10	10	10
Machines with air reserve under standard by—						
C.f.m.						
1	1	2	2	4	3	3
2	—	—	2	4	2	2
3	8	16	2	4	10	10
4	3	6	4	8	7	7
5	2	4	7	14	9	9
6	6	12	4	8	10	10
7	3	6	2	4	5	5
8	3	6	5	10	8	8
9	1	2	3	6	4	4
10	5	10	—	—	5	5
11	2	4	3	6	5	5
12	1	2	3	6	4	4
13	1	2	—	—	1	1
14	1	2	—	—	1	1
15	1	2	1	2	2	2
16	1	2	—	—	1	1

Note: In Te Awamutu area one machine had an air reserve at 9 c.f.m. above standard.

TABLE 4—SUMMARY OF MILKING TECHNIQUE: TE AWAMUTU AND THAMES AREAS

No. of herds	Av. No. of sets of cups	Total units of labour	Total cows	Av. No. cows in herds	Av. No. cows per set	Av. No. cows per unit of labour	No. of cows per set per hour	No. of cows per unit of labour per hour	Av. milking time per cow in minutes	Ratio of labour units to sets of cups
SINGLE-UNIT MILKING MACHINES—HAND STRIPPING										
14	3.7	28	849	60.6	16.3	30.3	9.41	16.18	6.37	1 to 1.8
SINGLE-UNIT MILKING MACHINES—NO HAND STRIPPING										
29	3.7	45	1,750	60.3	16.05	38.8	9.20	22.12	6.52	1 to 2.4
DOUBLE-UNIT MILKING MACHINES—HAND STRIPPING										
5	5.8	9	316	63.2	10.9	35.1	6.21	20.41	9.65	1 to 3.2
DOUBLE-UNIT MILKING MACHINES—NO HAND STRIPPING										
30	7.0	49.5	1,961	65.3	9.3	39.6	5.75	24.81	10.41	1 to 4.2

TABLE 5—OVER-ALL RANGES OF SINGLE-UNIT AND DOUBLE-UNIT MACHINES

	Cows per hour per set	Cows per hour per unit of labour	Minutes per cow per set
Te Awamutu	4.7 to 15.0	11.8 to 60.0	4.0 to 12.7
Thames	4.0 to 13.3	10.0 to 40.0	4.3 to 15.0
Both areas combined ..	4.0 to 15.0	10.0 to 60.0	4.0 to 15.0

Vacuum gauges were found inaccurate in 51 per cent. of the examinations and with a margin of error of from $\frac{1}{2}$ in. to 3 in. Not considering those with an error of under 1 in., there is a total of 33 per cent. with a margin of error between 1 in. and 3 in., which means that in some cases where the vacuum gauges were showing 15 in. of vacuum the farmers were actually operating the machines under 18 in. of vacuum.

Tables 1, 2, and 3 show clearly the unsatisfactory mechanical condition of a large percentage of fundamental working parts and the impaired operating efficiency of a substantial proportion of milking machines in use.

Milking Technique

The checking of the milking machines provided an opportunity to collect some data on milking practice, and the results provide some interesting comparisons. The percentages and figures are not strictly accurate because the times of milking were not measured, but they are the figures supplied by each farmer concerned and will therefore be sufficiently accurate for practical purposes.

Tables 4 and 5 show the rate of milking under various headings, including hand stripping and no hand stripping, and the use of single machine units compared with doubled sets. Dual units have been discarded from the summary and only those machines operated on a complete single-unit or double-unit basis have been included.

An extraordinary range of milking times was indicated in both areas, proving that much more consideration of milking technique would be an advantage in a large number of milking sheds.

The average milking time per cow on single-unit machines is shown as a little over 6 minutes, a figure very close to the general estimate, but the range among individual herds is from 4 minutes in the lowest to 15 minutes in the highest.

Though the inefficiency of some milking machines included in the survey has played a part in the very

low milking rates in a number of cases, a perusal of the individual figures shows that unbalanced machines have been a greater general factor. In some cases the ratio of units of labour to sets of cups is quite unbalanced, resulting in a slower milking rate per unit of labour and per set of cups.



Combating Hive Moisture

IN some parts of New Zealand humid conditions are responsible for considerable hive mortality and serious deterioration of bee-ware. This article by D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, describes aspects of excessive hive moisture and the control of ventilation by using a lid specially designed to combat this problem in North Auckland.

IN parts of New Zealand and in North Auckland in particular excess moisture is a problem of considerable magnitude affecting both bees and hive material during winter and spring. Bees die off consistently during winter and mortality increases as they are called on for greater activity during spring.

Internal hive parts become permeated with moisture, and water lies on the top bars of frames and behind the tin rabbets of the supers.

Much bee-ware has been made from poor-quality timber in recent years and frequently this rots beyond repair in the North Auckland district after no more than a season's service.

Factors mainly responsible for these conditions are atmospheric moisture, exhalations by bees, and the water vapour associated with the conversion of nectar into honey. Atmospheric moisture is governed largely by climatic conditions, and ill-fitting and damaged wood-ware subject the bees needlessly to its effects.

Fresh air, breathed by humans and bees alike, is much warmed and heavily saturated with moisture when exhaled and its oxygen content is reduced and carbon dioxide content increased.

Early nectar flows, particularly that from manuka (*Leptospermum scoparium*) in northern areas, occur in the wettest months of the year and contain a high percentage of water.

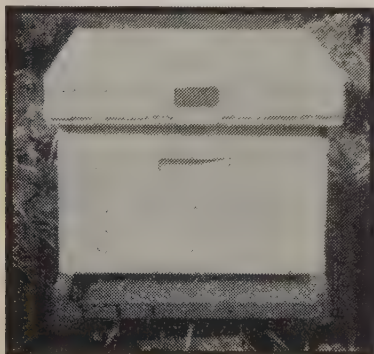
Ripening of Honey

The ripening of honey at normal periods is accomplished without difficulty by strong colonies of bees, as high temperatures and drying winds assist in disposing of excess water. However, with early-spring flows, the drying agents already mentioned are absent and hives below peak strength are generally faced with a task beyond their capabilities.

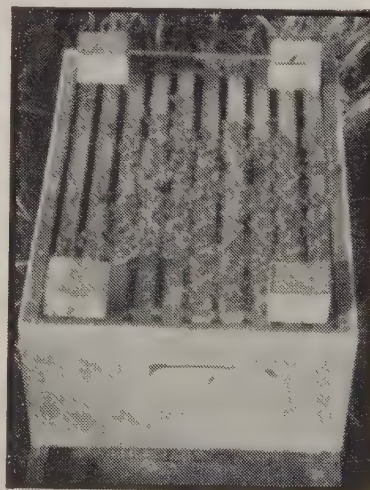
The warm air exhaled by the bees rises to the top of the hive and, unless it can pass quickly to the outside atmosphere, the water it contains condenses and saturates the lid, frames, and hive parts.

Gable hive roofs in use in a North Auckland apiary.

Through ventilation provided by the gable lid has been denied colonies since the flat-top lid has come into favour. Lids of the gable type allowed for adequate air space above the combs and if they had a gauze-covered ventilation hole in the front end, a system of upward ventilation was created, dissipating the warm air that rose to the top of the hive. Although this advantage in areas subject to moist conditions was recognised, it is claimed they were not suitable where hives required to be moved to new sites. A further objection was that they were not satisfactory as a rest for supers during hive manipulations. However, despite these disadvantages, which are very simply remedied, no objection can be raised against their



Hive with ventilated lid.



Hive with blocks in position. The lid rests on the blocks, allowing better air circulation.

COMBATING HIVE MOISTURE . . .

use in apiaries in fixed locations. To prevent the lids tipping when supers are rested upon them, a brick or a suitable block of wood can be placed under one side, and as beekeepers today usually use screens when moving hives, the lids can be carried separately.

There have been many attempts to adopt the flat-top type of lid to provide suitable upward ventilation, the simplest being the use of strips of wood $\frac{1}{4}$ to $\frac{1}{2}$ in. thick fastened along the inside edges of the lids and having a piece 2 to 3 in. long cut out of the middle of each strip. This provides an air space between the lid and the hive body at sides and ends through which the rising air can escape.

New Type of Lid

In the Auckland district a method used by one beekeeper appears to have solved the problem. His lids have two oblong holes $2\frac{1}{2}$ in. x 1 in. cut in the top edge of the end pieces at the time of manufacture. The holes are covered with wire gauze to prevent the bees using them as additional entrances. A further air space above the combs is provided by placing four small blocks (cut from scrap 3 in. x 2 in. timber) at the four corners of the top super and resting on the frames. The lid rests on the blocks well above the combs and there is free upward movement of air through the hive, so that normally no condensation can occur.

Hive mats are discarded between April and September and colonies are allowed full entrances throughout the year.

Occasionally mice are troublesome, in which case a piece of wire gauze is fixed over the entrance, which is not reduced in size, leaving an opening 3 in. x $\frac{1}{2}$ in. for the bees.

Though the amount of ventilation provided may appear to be excessive, it has proved a boon in apiaries where formerly there was a high death rate of bees and the loss of hive material through dampness was a serious financial hardship. Hives fitted with these lids and blocks winter well in North Auckland districts and in spring emerge strong and vigorous. Consumption of winter stores appears normal and combs remain free from mould.

Modification for Windy Areas

In areas where high winds are prevalent it would be necessary to make the ends and side pieces of the lids at least 5 in. deep, as the blocks prevent the standard lid from overlapping more than $\frac{1}{4}$ to $\frac{1}{2}$ in.

The blocks remain on the hives until the main honey flow has ceased, when they are temporarily removed until the danger of robbing has passed.

Colony protection has in the past aimed mainly at conserving the heat of the colony without regard to ventilation. Excessive protection in the form of reduced entrances and mats and packing to conserve heat has resulted in providing the means of creating hive moisture in North Auckland. Hive mats of hemp or similar material do nothing to conserve warmth in districts where humidity is high. They remain wet throughout winter and merely add to the discomfort of the bees.

Apiaries completely sheltered from wind are much more likely to be affected by excessive moisture. Colonies raised off the ground and exposed to the elements, but protected from southerly winds by some low shelter hedge, are fortified against hive moisture by the maximum amount of sunlight and drying effects of air circulation.

SHOW DATES

THE following are dates and venues of A. and P. shows up to the end of March.

February 3—Clevedon A. and P. at Clevedon.
February 3—Rodney Agricultural Society at Warkworth.
February 3—Rotorua A. and P. at Rotorua.
February 3—Banks Peninsula A. and P. at Little River.
February 3—Woodville A. and P. at Woodville.
February 3—Palmerston and Waiheke County A. and P. at Palmerston.
*February 6 and 7—Dannevirke District A. and P. at Dannevirke.
February 9—Dannevirke Ram Fair at Dannevirke.
February 9 and 10—Taranaki Agricultural Society at New Plymouth.
February 10—Hukerenui A. and P. at Hukerenui.
February 10—North Kaipara Agricultural Association at Paparoa.
*February 10—Rangitikei A. and P. at Taihape.
February 10—Pahiatua A. and P. at Pahiatua.
February 10—Katikati A. and P. at Katikati.
February 10—Waitemata A. and P. at Waiwera.
February 10—Tokoroa A. and P. at Tokoroa.
February 13 and 14—Ohura A. P. H. and I. at Nihoniho.
February 15—Christchurch Stud Ram Fair at Christchurch.
February 16 and 17—Masterton A. and P. at Masterton.
February 16 and 17—Franklin A. and P. at Pukekohe.
February 16 and 17—Taumarunui and District A. and P. at Taumarunui.
February 17—Tauranga A. and P. at Tauranga.
February 17—Murchison A. and P. at Murchison.
February 17—Waiapu P. and I. at Ruatoria.
February 21—Te Awamutu A. P. and H. at Te Awamutu.
February 23 and 24—Wellington and Hutt Valley A. and P. at Upper Hutt.
February 23 and 24—Buller A. and P. at Westport.
February 24—Te Puke A. and P. at Paengaroa.
February 24—Putaruru District A. and P. at Putaruru.
February 24—Waimarino A. P. H. and I. at Raetihi.
February 28—Opoitiki A. and P. at Opoitiki.
March 3—Walotira Junction A. and P. at Walotira.
March 3—Amuri A. and P. at Rotherham.
March 3—Albany A. and P. at Albany.
March 3—Matamata A. and P. at Matamata.
March 3—Temuka and Geraldine A. and P. at Winchester.
March 3—Maniototo A. and P. at Ranfurly.
March 3—Whakatane and Rangitaiki A. and P. at Whakatane.
March 7—Morrinsville A. and P. at Morrinsville.
March 10—Cheviot A. and P. at Cheviot.
March 10—Hawkes Bay A. and P. (autumn show) at Hastings.
March 10—Kumeu District A. and H. at Kumeu.
March 10—Mt. Benger A. and P. at Roxburgh.
March 10—Mayfield A. and P. at Mayfield.
March 13—Lake County A. and P. at Arrowtown.
March 15 and 16—Christchurch Flock Ram Fair at Christchurch.
March 17—Methven A. and P. at Methven.
March 17—Wellsford A. and P. at Wellsford.
*March 26—Mackenzie County A. and P. at Fairlie.
March 26—Strath Taieri A. and P. (jubilee show) at Middlemarch.
*March 31—Hawarden A. and P. at Hawarden.
*The Department of Agriculture exhibit will be staged at this show.

METEOROLOGICAL RECORDS FOR NOVEMBER

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	60.9	+ 2.5	78.0	39.0	5.23	17		1.59	18	171.3
Auckland	160	63.3	+ 3.1	76.0	50.5	3.27	10	- 0.19	2.33	19	167.6
Tauranga	10	60.8	+ 2.0	74.2	44.4	3.56	12	+ 0.22	1.49	19	171.8
Ruakura	131	59.8	+ 1.8	75.5	41.1	5.27	10	+ 1.57	2.65	6	161.7
Rotorua	980	58.4	+ 1.9	76.0	41.8	5.99	14	+ 1.81	2.18	6	147.8
Gisborne	12	60.4	+ 0.7	82.4	42.9	7.98	19	+ 5.59	2.18	3	172.0
New Plymouth ..	160	59.8	+ 2.9	75.9	42.6	3.39	11	+ 1.32	0.90	19	183.5
Napier	5	61.4	+ 1.6	83.9	43.5	6.37	14	+ 4.32	1.50	20	166.2
Taihape	2157	54.8	+ 2.3	70.3	39.4	4.02	18	+ 0.70	1.08	12	
Wanganui	72	59.8	+ 2.1	74.5	43.0	1.55	11	+ 1.55	0.61	1	206.4
Palmerston North ..	110	59.6	+ 2.6	76.8	45.2	1.66	11	+ 1.61	0.58	22	200.0
Waingawa	350	57.2	+ 1.1	77.5	33.5	1.89	13	+ 0.55	0.39	17	208.1
Wellington	415	57.3	+ 1.7	71.1	43.3	1.66	9	+ 1.52	0.70	22	233.2
Nelson	24	59.4	+ 2.2	80.0	41.2	0.21	4	+ 2.73	0.13	17	276.9
Blenheim	12	59.2	+ 1.9	84.0	39.2	0.18	5	+ 1.60	0.06	1, 22	281.9
Hokitika	12	54.1	+ 1.2	69.6	38.5	5.96	8	+ 4.58	1.80	26	248.8
Hamner Springs ..	1225	55.0	+ 0.9	78.0	29.0	1.23	7	+ 2.24	0.34	17	232.0
Christchurch	22	58.0	+ 1.7	84.3	36.0	1.38	5	+ 0.42	0.50	22	258.5
Ashburton	323	55.7	+ 0.4	83.0	33.0	1.76	5	+ 0.67	0.75	30	262.6
Timaru	56	55.8	+ 0.2	78.8	35.2	2.55	8	+ 0.61	0.83	26	257.6
Alexandra	520	57.8	+ 1.4	82.6	32.2	0.76	3	+ 0.40	0.62	30	242.5
Taieri	80	53.7	+ 0.3	80.1	31.9	2.74	13	+ 0.39	1.08	30	222.0
Invercargill	32	53.5	+ 1.2	80.0	34.0	3.49	14	+ 0.52	0.82	25	186.6

CLEAN EGGS

EGGS are no longer in short supply in New Zealand, and poultry farmers are anxious that the consumption of eggs should increase. A fresh, clean egg as laid by a hen is an attractive item of food, but soiled or even cleaned eggs are far less attractive. How poultry producers can help themselves and their industry by marketing clean eggs is described in this article by M. E. White, Poultry Instructor, Department of Agriculture, Wellington. The points mentioned are simple and practical, but unfortunately are often overlooked.

THERE is ample proof that many poultry farmers do not give sufficient thought to the subject of the production of a really first-grade egg. Anyone doubting this should visit one of the egg floors and ask to see some of the dirty and stained eggs that are received every week. An egg has no better advertisement than a clean, fresh-looking shell, yet many eggs sent in for sale are stained, misshapen, dirty, and altogether most unattractive.

If eggs are to reach the market clean, they must be kept from becoming dirty, and that is not easy on free-range farms, especially in wet weather. However, the poultry farmer can take steps which help very materially, and the little more labour involved will be found well worth while.



The first stage at which eggs may be dirtied or damaged on the farm is in the nest boxes. An ample number of a good type of nest boxes, well filled with nesting material, and kept clean and well cared for as are those shown above, keeps this type of economic loss to a minimum. Neglected nest boxes such as those below cause unnecessary dirtying and breaking of eggs.

Design and Maintenance of Nests

Nests should be ample in number and of uniform design.

China nest eggs could be used more commonly; the cost is a trifle and they last a long time. Their value is in attracting the hens to lay in more than one or two favourite nests. Most poultry farmers find that, though all the nests may be the same shape and on the same level, the hens will crowd to certain nests, as a hen prefers to lay her egg where there are others. The intelligent use of china nest eggs will solve this problem.

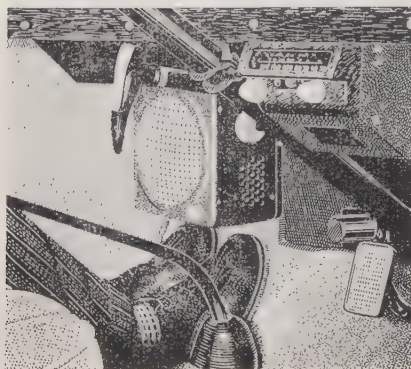
The nest itself must be not smaller than 14in. by 8in. and high enough to allow the hen to stand upright. A 4in. batten along the bottom front prevents the nesting material from falling out. Half-inch wire-netting floors are used in nest boxes with considerable success, but if the nest flooring is wood, great care must be taken to ensure that it is always well covered with some soft material to prevent breakages of thin-shell eggs. There is no better foundation for nests than sand, and on top of this straw, hay, shavings, or dried leaves may be used. However, fowls dearly love to scratch around, and periodic checks should be made on the nesting material to see that there is ample to prevent breakages. All nests should be detachable and should be thoroughly cleaned out periodically.

At certain times of the year hens will sleep in the nests, and often during the moulting period a shy hen will seek shelter in a nesting box at night. Steps must be taken to stop this habit. Arranging a board to close all the nests after the evening grain feed is not difficult, but so that nests will be available early in the morning these shutters must be opened again after dark. If the two-storey type of nests is used, closing the bottom row will not be found necessary.



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PRODUCING CLEAN EGGS FOR MARKET



A well-ventilated concrete egg room which provides cool, clean conditions free from material which may taint the eggs.

Quite close to the nesting boxes should be a holding box in which any eggs laid are placed each time the shed is visited on routine work. Picking up the eggs is only the work of a moment and requires far less time than may be needed to clean them if an egg is broken in the nest. This system is better than collecting the eggs two or three times daily over the whole farm and also facilitates keeping the egg-record sheets.

Cleaning the Eggs

The good poultry farmer packs every egg on the day it is laid. This prevents the accumulation of work, makes cleaning very much easier, and reduces the risk of eggs becoming stale. The usual routine is to collect the eggs before feeding the birds or, in some cases, at feeding time. As soon as the feeding is completed the eggs should be packed. Some of them are certain to be at least slightly soiled. If the eggs are laid out on a wire-netting table, they can be sorted over quickly, the clean ones being packed first and graded roughly according to size and colour.

Eggs should never be soaked in water to remove dirt. Several small towels should be kept for wiping them, but a dirty piece of rag is often used day in and day out without a thought of the germs that it carries. If several towels are used and boiled periodically, the eggs will not be liable to bacteria infection and will keep longer. The aim should be to rub off any dirt, not to rub it in. The towel should not be really wet, but just damp enough to avoid making wet spots on the eggs.

Packing and Storage

Packing an egg thick end uppermost helps to protect the air cell from damage. Agents will supply good crates and clean fillers if they know

the producer is anxious to send in good eggs, but a few spare fillers should be kept in case damaged ones arrive. Any dust that they may have collected in their travels should be cleaned off the fillers, but they should not be handled roughly.

Abnormal-shaped eggs should be used at home or packed carefully in the top layer and well protected.

The method of storing the eggs is important, for a fresh egg quickly absorbs strong flavours, particularly

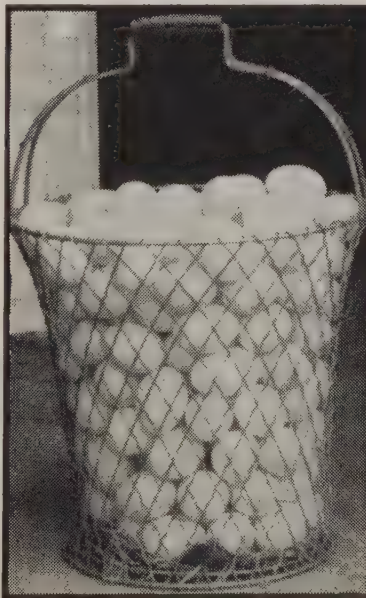
those of onions, fish meal, and kerosene. Eggs also dry quickly if exposed to a warm current of air. It is essential that they be cooled before being packed in their travelling crates and be placed in a cool place away from draughts. If eggs are to be delivered to a station or directly to an agent, the crates need to be well covered to prevent dust soiling the eggs during transit.

If the old-type fillers and flats are used, no extra-long eggs should be packed or they will be broken in transit. Cushioning material should be placed on the bottom of the crate, half-way up, and on the top layer to prevent movement.

Eggs should be delivered twice weekly if possible, or at least once weekly, in which case care should be taken to ensure that every egg is packed. All sections must be filled, and as soon as the eggs are dispatched the agent should be advised of the exact number being sent, in addition to a docket being enclosed inside the crates. The poultry farmer is well advised to keep in touch with the egg agent to learn if his eggs are arriving in good order and to seek his advice about packing if necessary.

BULLETIN ON INCUBATION

Every aspect of incubation, from the choice of a machine to the marking of the chicks, is dealt with in Department of Agriculture Bulletin No. 197, "The Theory and Practice of Incubation", which has been revised and reprinted. It also includes a section on natural hatching for the benefit of household poultry keepers and farmers who wish to hatch out special pedigree stock in small numbers. This bulletin may be obtained from any main office of the Department of Agriculture for 6d., post free.



Eggs collected in this type of basket cool rapidly in readiness for packing.

POPCORN

Upper right—Rows being marked out and opened up and seed being sown by hand; 3 seeds are dropped at 3ft. intervals. Above—After the seed has been planted the ground is harrowed, covering the seed.

Above—The area 6 weeks after sowing; low ground in the centre was unsuitable, and growth in this patch was slow. At left—The area 10 weeks after sowing. Below—The area 14 weeks after sowing.

POP CORN: A Marlborough Venture

By S. FREW, Orchard Instructor,
Department of Agriculture, Blenheim.

FOR many years pop corn has been known in New Zealand, usually as a novelty form of foodstuff made up as an attractive confectionery, sold generally at booths at agricultural and pastoral shows and holiday resorts. Recently, however, the industry has been placed on a more substantial footing, and the production of a suitable corn for this trade, and its subsequent processing, has been the successful venture of a small group of Marlborough farmers and businessmen. The story of this development is interesting and gives a further proof that initiative, painstaking trouble, and confidence of success in new fields are still qualities to be found in New Zealanders.

THE production of pop corn in Marlborough was first introduced by Mr. R. A. McPherson, of Blenheim, who, knowing the tremendous expansion and ramifications of the business in the United States of America, saw possibilities in the development of both the growing and processing of pop corn in New Zealand. Taking into account the fact that the Marlborough climate approximated that of the corn belts of the United States, he decided to grow a small trial crop. In 1945 he obtained his first small sample of good hybrid corn seed from the United States and planted it in his back garden. Results were so encouraging that the next year he imported a larger quantity of seed, sufficient to grow a series of trial areas.

Several Varieties Tried

Several varieties were tried and various locations used, the object being not only to determine which varieties were best adapted to local growing conditions, but which type of land would prove most suitable. Results on this occasion were not so uniformly good, but much was learned from the fairly extensive trial plots. One 2-acre block, for various reasons, proved a complete failure, but the knowledge gained enabled similar mistakes to be avoided in future. In some instances, however, the results were very satisfactory, the yield often far exceeding comparable yields in the United States, and the quality of the corn was excellent.



[Snapshot House photo.]

After being popped, coloured, and sweetened the pop corn is packed into transparent cellulose bags for distribution to merchants.



[Snapshot House photo.]

Close-up of pop corn plants.

Mr. McPherson's partner in the first trials was Mr. H. Charleston, a Blenheim business man, while Mr. J. Broughan, a Blenheim farmer, showed a truly venturesome spirit in agreeing in 1946 to devote some of his valuable land to this unconventional crop, and his wide knowledge of local conditions and lifetime farming experience were invaluable to the partners in these early stages.

The product from the trial plots was processed in a little room at the back of Mr. Charleston's brush factory in Blenheim, a frying pan being used to pop the corn. The pop corn was then laboriously coloured, sweetened, and packed into transparent cellulose packets by hand, and late in 1946 the market was tested out with this small parcel of processed corn. Its immediate success and the insatiable demand from the trade for further supplies convinced the originators of the scheme that they could expand and consolidate their business with confidence, and from that date, although further trials were still being made, the initial experimental stage could be said to have concluded successfully.

Early Difficulties

During this stage setbacks and difficulties were experienced in the factory as well as in the field. Shortages of sugar and other materials used for processing had to be overcome, permission to import better equipment obtained, labour trained for the factory work, and methods of handling revised or discarded. During this period also results from trial areas were tabulated and checked with painstaking thoroughness. But with these difficulties successfully passed commercial production was begun, at first, in a small way only.

First Commercial Production

In 1947 a total of 4 acres was planted on Mr. J. Broughan's property. Already the likely varieties in the trial plots had been checked for production per acre, popping expansion, maturity dates, and general suitability for local conditions, and a supply of specially crossed seed of the most promising varieties ordered from the United States. The resultant yield was outstandingly good and the processing of this crop enabled the small factory to keep producing fairly steadily for a while. Supplies, however, were still wholly inadequate for the demand and arrangements had to be made to import corn for popping in order to keep the factory going and to fulfil at least a proportion of the orders outstanding. The imported corn proved quite inferior to the local product and it was realised that a

PRODUCTION DEPENDS UPON TRANSPORT

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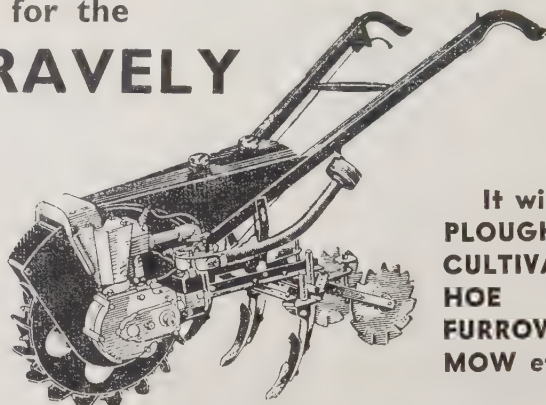
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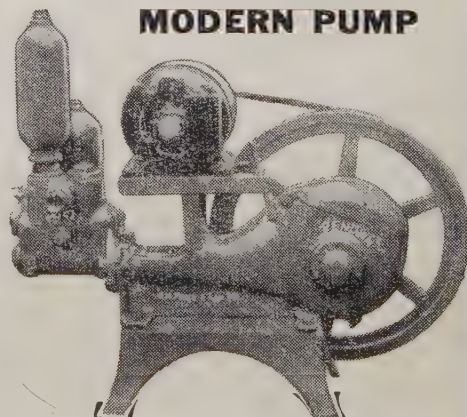
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PRODUCTION OF POP CORN SEED

substantial increase in acreage locally would have to be planned if importations were to be avoided and the high quality of the local product maintained.

Increased supplies of the specially crossed seed were therefore ordered for the 1948 growing season and in that year a total of 40 acres was devoted to the crop, while for the 1949-50 and subsequent seasons a total of 80 acres has been the objective.

Production of Hybrid Seed

The steady expansion of the industry in Marlborough has brought its special problems, an important one being the availability of seed for the increasing area planted. Until 1949, seed was imported from America, and not only was this a costly business involving dollar expenditure, but continuity of supply was uncertain. All high-quality pop corn seed comes from a carefully bred hybrid plant, but to use second-year hybrid seed for production of plants would be to court disaster, and a very low yield of inferior corn might result. It was felt therefore that the time had arrived when the work of hybridisation should be undertaken locally in order to ensure supplies of seed and retain those varieties which have proved so satisfactory.

In the United States innumerable crosses have been made in the breeding of special varieties, but there are four main parent varieties suited to New Zealand conditions and a further three are being subjected to further trials. Originally, production was carried on with an imported hybrid produced from two of these strains. A small supply of seed of the seven strains suited to New Zealand conditions was, however, imported in 1948. As only a few seeds of each variety were available, cross-pollination and the production of hybrid seed on a large scale could not be attempted immediately and the first year had to be devoted to increasing the amount of parent seed.

To ensure purity of strain the different varieties of seed were grown in the first year in isolated areas and hand self-pollination of all plants was undertaken. This meant the placing



[Snapshot House photo.]

To maintain purity of parent strains of stock seed it is necessary to prevent cross-pollination. Having covered the ear shoots before the silks appeared, these operators are now covering the tassels before the pollen ripens in order to ensure that it will be available for later hand pollination.

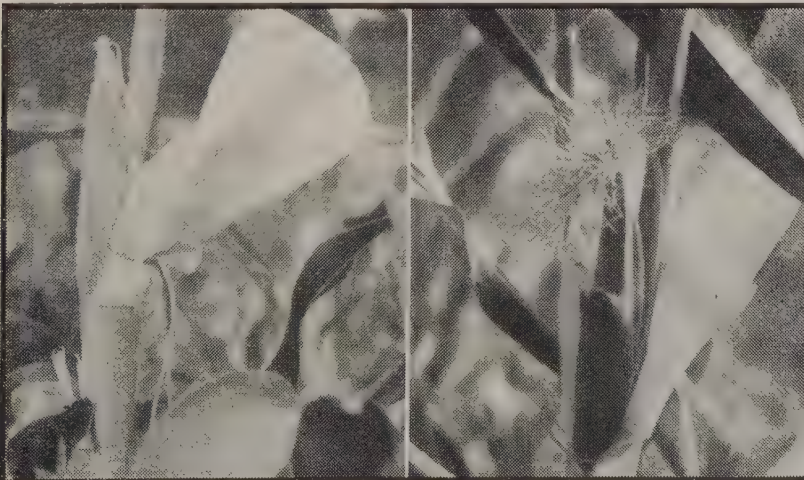
of bags over all tassels to collect the pollen and the covering of all ear shoots to prevent contamination from other sources; 3000 specially manufactured bags were used for the purpose. When the ear shoots reached the correct stage for the reception of pollen the bags over the tassels were removed and the pollen transferred to the silk on the ear shoot. Thus per-

petuation of the true parent varieties was assured and a good supply of seed is available for hybridising. Actually the work has to be done each year if the parent strains are to be retained and never can the whole of the available seed be used for the production of hybrid seed.

For the actual hybridising cross-pollination is encouraged by the field planting of alternate rows of the two parent strains. The resultant seed will then be stock seed for planting out pop corn areas the following year. Since the 1949-50 planting season sufficient hybrid seed has been available in Marlborough for all New Zealand production requirements.

Climate and Soil

Results from the trials made in Blenheim demonstrated clearly that the Marlborough climate was particularly suited to this type of crop. The prerequisite for successful corn production is a dry autumn, enabling the seed to dry out to the requisite moisture content for successful popping. A low humidity is therefore essential and few parts of New Zealand could be considered as satisfactory as Marlborough in this respect. The danger of early frosts, is, however, a possible disadvantage and this has to be countered by growing early or quick-maturing varieties. The trials also illustrated the need for careful selection of growing sites and soil types. The corn plant will not flourish in wet conditions and good drainage and a warm soil are necessary. A heavy type



[Snapshot House photos.]

Left—Close-up of covered and uncovered cobs. The tip of the exposed cob has been cut to hasten the emergence of the silk. This is the correct stage to bag.
Right—The silk emerged and ready for pollination.

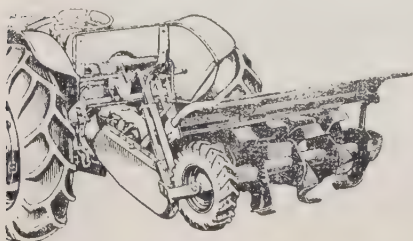
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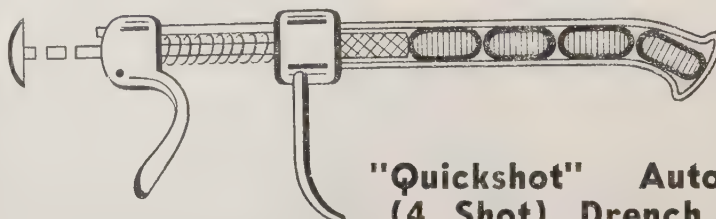
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PRODUCTION OF POP CORN SEED

of soil is useless and the best results were obtained on a sandy silt loam of good depth with a free subsoil. Such land is available in Marlborough in many localities and in every way this district seems to have unique advantages for pop corn culture.

Types of Corn

The development of corn hybrids has been an important work in the United States during the past 30 years and today their strains are outstanding, improved varieties having been bred for all corn-growing areas. Not only have strains been produced which give greatly increased yields and resistance to stalk breaking, but varieties with regulated maturity dates have been tabulated and it is possible now to get a strain or variety with a short- or long-growing period as required. The main factor with improved American strains, however, has been the increase in the popping expansion rate. Old varieties of corn had a popping expansion ratio of approximately 15:1, but with several of the latest strains this ratio has been increased to 32:1 (that is, the corn will expand after popping to 32 times its original size).

Naturally the economic variety to grow is the one with the greatest volume per acre of popped corn, not necessarily the variety with the highest popping expansion. This, therefore, was one of the main objects of investigation in the local trials, and of the varieties found to grow best under local conditions seven were selected which complied with the qualification. Actually, most of them have a popping expansion ratio of approximately 30:1 and this together with their heavy production of seed per acre ensures a high yield of high-quality corn.

Pop Corn Culture

With the industry now in full-scale production, the rather crude methods previously adopted in the field have been superseded, but in the beginning the culture of pop corn was on simple lines, the salient features being as follows:—

Sowing: After a deep autumn ploughing the land is worked to a fine tilth in spring and sowing begun at the end of October, when the risk of late-spring frosts is over. One of the



[Snapshot House photo.
Hand pollination. Pollen from a tassel being shaken on to the corn-ear silk.

simplest and most successful methods has been that employed by Mr. Broughan, who drilled in the seed, in rows 28in. apart, with reverted superphosphate. An ingenious disc with holes at regular intervals, replacing the stars in the drill, also sowed the seed successfully and at fairly even spacings. Another area was sown by hand, three seeds being sown together at 3ft. intervals with 3ft. between the rows. This method, although laborious, resulted in a rowed crop which could be cultivated both ways, a decided advantage over drilled seed, where weed growth could not be eradicated in the rows.

American authorities favour the regularly spaced, row-crop method, allowing cross-cultivation, and claim that increased production may be expected from this system. Though little difference in crop weight has been noticed here, this method is now recommended because of the better control of weeds achieved. It is hoped to obtain a proper corn planter for the use of local growers for next

season's sowing. This machine is reputed to drop three seeds at regular intervals in each row and therefore should be ideal.

Cultivation: Where seed is sown with the drill subsequent cultivation has been confined to a harrowing while the plants are still small enough not to be injured, but with the spaced sowing, cross-cultivation with a small inter-row cultivator is maintained until fairly late in the growing season.

Manuring: In addition to 2cwt. of reverted superphosphate at time of sowing, side dressings of sulphate of ammonia are beneficial, and on most types of land a substantial dressing of lime is required to produce satisfactory crops.

Diseases: Very little trouble has been experienced with disease. Caterpillars, identified as the corn earworm or tomato caterpillar, have been noticed in isolated instances, but so far the percentage of plants affected is too small to cause alarm and, moreover, the caterpillar appears to attack

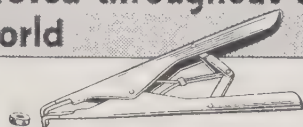


Left—Odd weeds are removed by hand hoeing. Right—Mechanical cultivators such as this can be used until the corn grows too high.

[Snapshot House photos.

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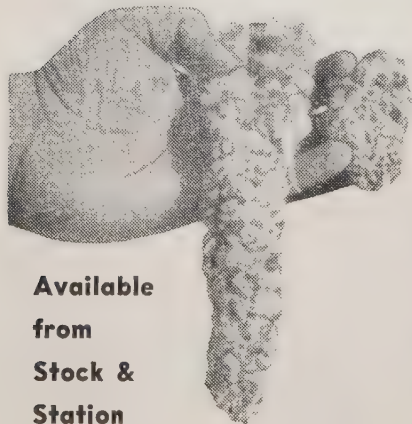


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the cob too late to cause serious damage. In some areas grass-grub has taken occasional plants.

Harvesting: While the growing of pop corn was in the experimental stages harvesting was done by hand, but this could not be attempted with a large area and it was then that the advantages of Marlborough's dry autumn were appreciated. The corn matured perfectly on the plant and a header harvester successfully threshed the seed without damage. American authorities, however, are unanimous in their opinion that the corn is better harvested in the cob, and in 1950, therefore, a mechanical cob harvester was imported. This was found to make an excellent job, up to 4 acres of cobs per day being picked by this means.

Drying of corn: For corn harvested by the header the only drying necessary was to spread the seed over wooden floors for a short period to prevent any risk of mould developing. The most efficient means of drying seed in the cob has been to deposit the cobs in a hop kiln for a few hours.

Moisture content: For successful storage and popping the moisture content of the corn must not exceed 14 per cent. Fortunately field-ripened corn in Marlborough has a moisture content of only 15 per cent. when harvested and thus is approaching reasonable storage and popping condition. In most parts of New Zealand this low moisture content could not be obtained in the field and a major difficulty in drying to the correct stage would be encountered.

Production per acre: In Marlborough up to 4000lb. per acre has been obtained in some seasons and the average must be at least 3000lb. per acre.

Processing: The simple method of the first trial years has now, of course, been superseded by greatly improved equipment. The latest and best popping machines have been imported

PRODUCTION OF POP CORN SEED



[Snapshot House photo.]

A block planted on the square, which enables cultivation to be done both ways.

and, as these are capable of turning out 25,000 packets per day, production is now reaching large proportions. After being popped with essential oils the corn is immersed momentarily in a bath of colouring and sweetening agents and then packed in attractive transparent cellulose packets.

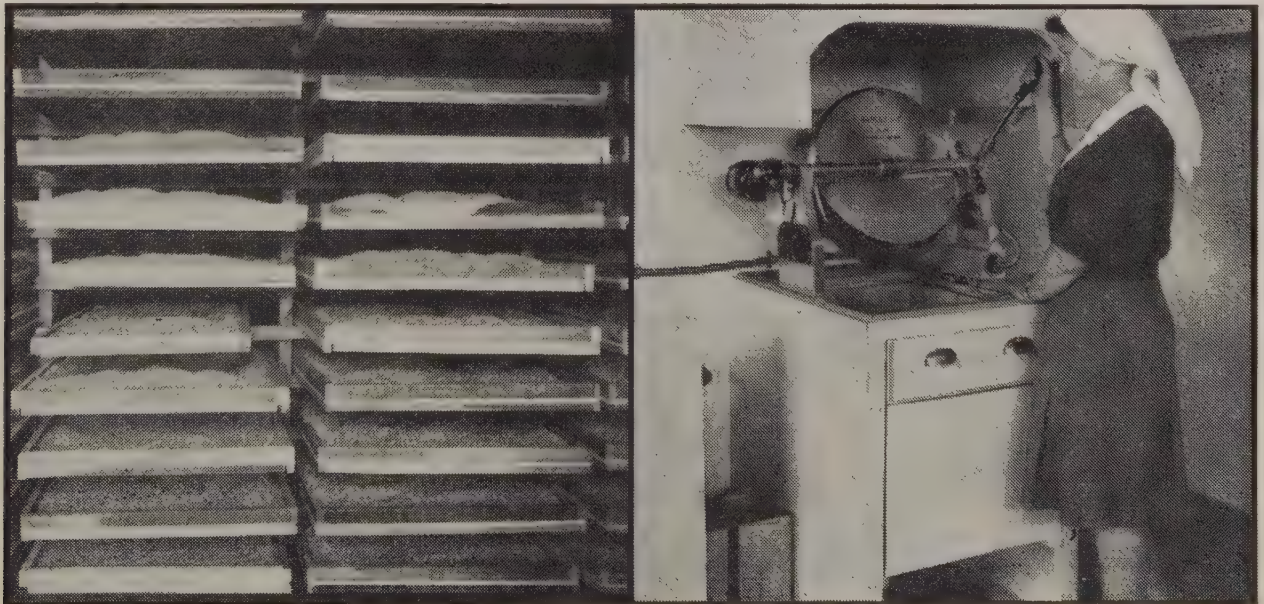
Distribution and sale: The whole of the output from the Marlborough factory has been disposed of through various stores, at first mostly in the North Island districts, but by last year distribution had become Dominion wide.

Success Result of Careful Work

The success of the local industry is undoubtedly the result of the careful and thorough work done in the initial

stages. Only improved strains of seed, proved suitable for local conditions, have been grown and great care has been taken to select suitable land for their production. Some of the corn imported in the past has been of comparatively inferior quality and it is pleasing that it can be said definitely that the local product, though being produced at a price comparable with imported lines, appears to be a superior corn in every way and is much sought after by the whole trade.

In a small way pop corn is taking its place among the industries which help to make New Zealand self-supporting, and full credit must go to the originators of the scheme for their initiative and enterprise, which so successfully converted this industry from an idea to a reality.



[Snapshot House photos.]

Left—After harvesting, the seed is dried on wooden racks. Right—One of the popping machines in operation at the factory.

Surface-sown Hill-country Pasture Improvement

SEASONAL NOTES Contributed
by the EXTENSION DIVISION

SEASONAL work in surface-sown hill-country pasture improvement covers oversowing of clovers and topdressing, the sowing of grass and clover seed mixtures following secondary burns, and seed-bed preparation after surface working on country which may be cultivated with crawler tractors.

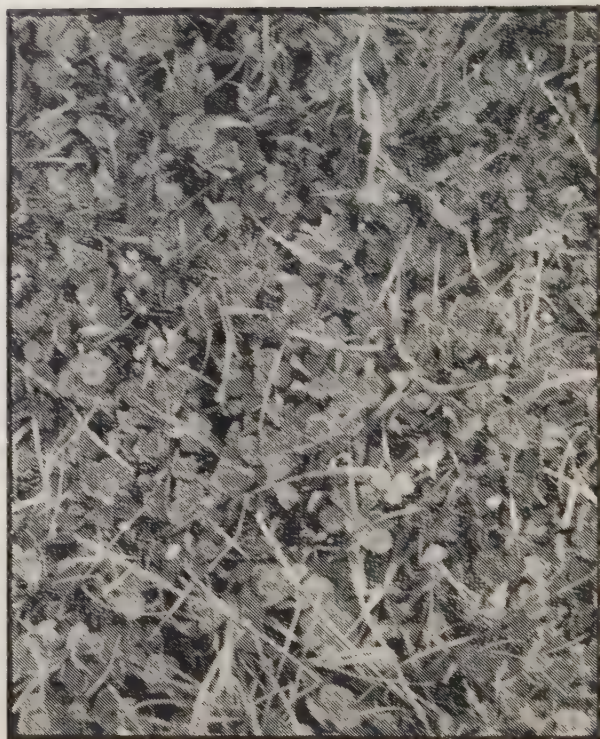
VALUE OF CLOVER Phosphatic topdressing of hill country gives little or no response unless clovers are present, and on most country white and/or subterranean clovers have to be introduced by oversowing as an integral part of the topdressing programme. Subterranean clover should be used where the rainfall is below 40in. and particularly where the summer and early autumn are very dry and the soils light. White clover is easier to establish than subterranean clover when the rainfall is 50in. or more and the soils are moisture retentive. Where the rainfall is between 40 and 50in. and there is a danger of summer drought a mixture of the two clovers should be used.

SOWING White clover should be sown at the rate of 1 to 2lb. per acre and subterranean clover at the rate of 3 to 5lb. per acre. Trials have shown that autumn is the best time to sow both clovers, and early-autumn sowings are preferable to ones in late autumn. However, it is advisable, particularly in districts with dry autumns, to wait until the weather breaks before sowing. Subterranean clover usually strikes best on areas which have been lightly stocked over the summer and then grazed off by cattle just before sowing.

NATURAL SEEDING Poor strikes of both subterranean clover and white clover can be much improved in the first year or two by spelling the pasture or lightly grazing it with cattle in November and December for subterranean clover and in December and January for white clover. In both cases, but especially with subterranean clover, spelling allows the plants to spread over the ground and provides a wider distribution for natural seeding. Phosphatic topdressing gives maximum results only when the pasture contains a good proportion of clover plants.

SECONDARY SOWINGS In the past mixtures for secondary sowings following manuka and fern burns were designed to provide a short period of life for the better grasses and clovers sown and then for permanent establishment of danthonia and browntop. The introduction of better methods of topdressing hill country now allows the establishment and maintenance of better pastures. Perennial ryegrass, crested dogtail, and white and subterranean clovers should form the basis of mixtures (about 18lb. per acre), which with topdressing will provide a permanent high-producing sward. The advisability of including cocksfoot depends on the amount of ash cover (and the price of seed), as cocksfoot requires a deeper ash cover than is sufficient for perennial ryegrass, crested dogtail, or clovers. *Lotus major* should be included in mixtures for high-rainfall areas.

CLEARING STRAW FROM SEED CROPS To minimise the depressing effect of taking seed crops from pastures the threshed straw should be swept off the field as soon as possible after the harvest. Many farmers are satisfied that if the header used for harvesting is fitted with a straw spreader, the smothering effects of the straw



Subterranean clover on hill country which has been topdressed.

are sufficiently minimised, but only in very thin crops is this so. In medium to good crops of ryegrass or white clover the bulk of threshed straw is considerable and even if the straw is spread by a straw spreader, it lies too thickly for pasture growth to recover. Further, the mass of straw certainly encourages grass-grub and porina (*Oryctes*) attack.

BLUE LUPINS

Blue lupins for green manuring or for feeding are usually sown in summer. If sown during January or February, they reach maximum growth in April, May, or June, depending on the season and locality. They may be used for sheep feed at those times and grazing should take place just before flowering, as though lupins are resistant to heavy frosts in the younger stages, they are very susceptible to damage once the flowers have appeared. Seed should be sown on ground that has been well worked and is firm at the rate of 2 to 3 bushels per acre and drilled as shallowly as possible.

POISON BAITS FOR CRICKETS

An article in the December, 1948, issue of the "Journal" recommended the use of sawdust as a substitute for bran in making poison baits for crickets. Subsequent experience has shown that where pastures are thin or where a field is under cultivation sawdust gives satisfactory results, but where pasture swards are good something better than sawdust is required to tempt the crickets and in these circumstances it is necessary to use bran or equal parts of bran and sawdust to provide a thoroughly effective bait. Another point in favour of bran or fowl mash is that the bait remains effective for 3 or 4 weeks whereas the sawdust bait loses its effectiveness as soon as it has dried out.

POISONOUS PLANTS IN NEW ZEALAND

THIS is the fourth section of a series of descriptions of poisonous plants which grow in New Zealand by H. E. Connor, Botanist, Department of Scientific and Industrial Research, Wellington. Glossaries to be used with the series were published with the first section, which appeared in the October "Journal".

DICOTYLEDONS

Hypericaceae

St. John's Wort. *Hypericum perforatum* L. (Fig. 7)

Botanical description: **Habit**—Herb with two-edged, erect stems up to 3 ft. tall arising from underground runners. **Leaves**—Up to 2 in. long, sessile, oblong to ovate-oblong, blunt, with numerous glandular dots. **Flowers**—Deep yellow, in corymbose cymes. **Fruit**—Dry capsule. St. John's wort can be recognised readily by its angled branching and yellow flowers. (Eurasia and North Africa.)

Habitat: Waste places, pastures, and roadsides.

Distribution: In scattered localities in both islands; locally abundant in tussock country in South Island.

General: Photosensitivity caused by St. John's wort and other *Hypericum* species is called hypericism. This disease is more important in Australia than in Europe and the United States of America, and in New Zealand its occurrence makes St. John's wort an important poisonous plant. Hypericism is reported in New Zealand from Otago, Marlborough, and the Mackenzie country. Sheep, cattle, and occasionally horses are affected by the plant, but only animals with weakly pigmented skins show the symptoms. St. John's wort is poisonous throughout the year. Drying of the plant does not make it innocuous, and therefore it may be poisonous if eaten with hay in which it is present in large enough proportions. At dipping time photosensitised sheep show symptoms peculiar to hypericism, and as a result of these symptoms sheep are frequently drowned. The sheep struggle violently, somersault in the dip, and drown unless rescued rapidly. A similar condition occurs when animals cross streams or rivers.

Symptoms of poisoning: The early symptoms are oedema of the ears, face, and muzzle and subsequent mummification of the skin. In sheep there is loss of wool down the midline of the pelt and portions of the ears are sloughed. Scabbing and rawness also result from the animals rubbing infected areas. Cattle lick or rub the infected parts of the body.

Poisonous principle: The photosensitising agent is presumed to be hypericin, a red pigment in the plant.

Hypericum spp.

From time to time other species of *Hypericum* have been suspected of poisoning stock. Tutsan (*H. androsaemum* L.) was reported as the cause of death in cattle in the Auckland area, but tutsan is generally regarded as non-toxic; feeding trials at the Animal Research Station, Wallaceville, have shown that the plant is non-toxic and

non-photosensitising. Tutsan may be distinguished from St. John's wort by its shrubby habit; its leaves 2 to 4 in. long and more or less heart shaped at the base, and its flowers, which are about 1 in. in diameter.

The native St. John's wort *H. japonicum* Thunb. has been suspected of poisoning sheep on the volcanic plateau. A feeding trial with dried material was negative. No photosensitising pigment is present in the plant.

H. gramineum Forst. f., another native St. John's wort, is also on the list of suspected photosensitising

plants. It was reported to be lethal to a cow at Lockwood, Auckland.

Rose of Sharon or Aaron's beard (*H. calycinum* L.), readily recognisable by its large, bright yellow, solitary flowers, has a very limited distribution in North Island, but has been suspected of stock poisoning.

Trailing St. John's wort (*H. humifuzum* L.), *H. acutum* Moench., and *H. montanum* L., though they have not been recorded as poisonous, should be treated as possible photosensitising plants.

Euphorbiaceae

Sun Spurge. *Euphorbia helioscopia* L. (Fig. 8, C and D)

Botanical description: **Habit**—Annual herb up to 1 ft. tall. **Leaves**—Alternate, ovate-cuneate. **Flowers**—In umbellately arranged inflorescences with up



Fig. 7—St. John's wort (*Hypericum perforatum*). A: Habit. B: Flower.

POISONOUS PLANTS IN NEW ZEALAND



Fig. 8—A (habit) and B (flower, 5 times natural size) of milkweed (*Euphorbia peplus*). C (habit) and D (leaf) of sun spurge (*Euphorbia helioscopia*).

to 5 forked rays. **Fruit**—Smooth capsule 1/5in. long. (Eurasia and Africa.)

Habitat: Gardens, waste places, and arable land.

Distribution: Common, especially in the North Island.

General: In general sun spurge is quite unpalatable to stock, but like other poison plants it may be eaten by stock for unaccountable reasons. No known cases of poisoning by sun spurge are on record for New Zealand, but poisonings are reported from Canada, Europe, and Australia. A boy is recorded as dying after having eaten sun spurge. Sun spurge should be considered as a plant of possible poisonous capabilities, though the results are not necessarily fatal. This plant may cause dermatitis in susceptible persons.

Symptoms of poisoning: Intense gastro-enteritis was produced in a lethal case.

Poisonous principle: Euphorbin is considered to be the toxin.

Milkweed. *Euphorbia peplus* L. (Fig. 8, A and B)

Botanical description: **Habit**—Annual herb up to 18in. tall, but usually smaller. **Leaves**—Alternate, stalked, broadly ovate to suborbicular. **Flowers**—In cymes, bracts ovate, terminating in sharp points. **Fruit**—Capsule 1in. long, smooth, with thickened, almost winged keels. (Eurasia and North Africa.)

Habitat: Gardens, waste places, and cultivated lands.

Distribution: Abundant in both islands.

General: Milkweed has been held responsible in New Zealand for the death of a cow and losses among hogs and lambs, and in Australia for the deaths of and sickness in horses, cows, and sheep. It is rather unpalatable to stock and usually is avoided, but hungry animals may include it with other feed while grazing. Milkweed has been shown to have no deleterious effects on poultry when fed experimentally. It is concluded also from experimental trials that large quantities must be eaten to produce symptoms of poisoning.

Symptoms of poisoning: Irritation of the mouth, salivation, gastro-enteritis, and soft faeces which may be blood-stained are the symptoms observed.

Poisonous principle: The juice of milkweed is acrid, emetic, and highly purgative.

Method of Extracting Disease-free Tomato Seed

THE seed-carried virus diseases tobacco mosaic and tomato streak and the bacterial diseases tomato canker and tomato speck are often introduced into tomato crops by infected seed. Recent work has shown that the causal agents of these diseases are carried on the surface of the seed and are destroyed when seed is extracted by the hydrochloric acid method or when infected dry seed is treated with this acid. (The hydrochloric acid method of extraction of tomato seed was described by C. H. Procter on page 480 of the May, 1948, issue of "The New Zealand Journal of Agriculture".)

Tests carried out with fruit from plants infected with tobacco mosaic

and tomato streak have shown that the viruses, which are readily recovered from seed extracted by fermentation or by drying on newspaper, are not present on seed extracted by the acid method. It has also been shown that the organisms which cause tomato canker and tomato speck are killed by this process.

Freedom from these diseases is therefore ensured if tomato seed is saved by the following acid extraction method:—

Well-ripened fruit should be selected from plants that are true to type, cropping well, and showing no obvious signs of disease. When pulp has been squeezed from the fruit mix 1oz. of commercial hydrochloric acid with the pulp from each 5lb. of fruit. Extrac-

tion must be done in a wooden or glass container and the mixture stirred frequently (with a wooden stirrer) for 3 hours, after which the seed is washed thoroughly and dried.

Further trials have shown that dried seed, if infected, is rendered free from the diseases by soaking it for 1 hour in a 5 per cent. solution of hydrochloric acid (1oz. of acid to 1 pint of water mixed in a wooden or glass container) and then washing it thoroughly. It is advisable to treat all seed of unknown origin by this method to ensure its freedom from disease.

—P. R. FRY and A. HASTINGS,
Plant Diseases Division,
Department of Scientific
and Industrial Research.



Distribution Trials with Blower-type Topdressing Machines

SINCE their development little more than 2 years ago blower-type fertiliser distributors have been used in increasing numbers throughout New Zealand. In view of the absence of precise information about the efficiency of the machines the Department of Agriculture, at the request of the Advisory and Co-ordinating Committee for the Aerial Distribution of Fertiliser and Seeds, undertook the measurements of distribution described in this article by P. B. Lynch, Crop Experimentalist, Wellington.

MEASUREMENT trials were made at Flock House Farm of Instruction, Bulls, during the week beginning February 13, 1950. They were made on flat land from a fixed point using four makes of machine, which are termed A, B, C, and D, and seven materials—serpentine superphosphate, superphosphate, superphosphate “fines,” basic slag, Heskett slag, ground North African phosphate, and ground limestone. The distribution of all these materials with the exception of serpentine superphosphate was measured.

The trials were conducted on flat land rather than on hill country typical of that being topdressed by such machines, primarily because measurements of distribution of the degree of precision required have been found extremely difficult to make on anything but reasonably flat land. Disturbances of the wind flow by gullies and ridges and practical difficulties associated with the accurate location of catching boxes and with measuring the ground area of sloping land are confusing factors. However, the distribution patterns obtained in the trials on flat land should give a good indication of what happens on hill country.

Again, in practice distribution is not confined to the spread from one fixed point and the machine may be mounted on a truck or trailer so that it is fre-

quently or continuously in motion. A picture of the spread under such circumstances has been built up from the patterns shown in the diagrams and is given later in this article. However, the time taken to produce a reasonable mean density of fertiliser on the ground must not be overlooked. To obtain a distribution rate of about 2cwt. per acre when using satisfactory material, it will be shown that the blower must operate from a fixed point for 2 to 3 minutes.

Description of Machines

Primarily, a rotary fan acting as a blower is used to lift the fertiliser sufficiently high into the air for a proportion at least to become wind-borne. Machines differ in capacity and output, in the method of feed into the airstream, and in provision for controlling the movement of the pipe through which the fertiliser is blown.

The direction of blowing has received attention, claims being made that blowing across wind gives better distribution than blowing down wind. However, the trial showed that the effect is negligible compared with the overriding influence of wind direction and speed. In some early types of machine the outlet pipe was vertical,

and this would appear to be as satisfactory as any other angle of elevation.

Effect of Wind Speed

Wind speed and direction in conjunction with the fineness of grinding of the material were found to be the main factors affecting distribution. It was found impossible to conduct measurements of spread in high winds, and wind speeds during the trials ranged between 5 and 18 miles per hour as measured by a portable anemometer. These speeds are generally considered satisfactory for distribution from blower machines. In light winds the direction of the wind tends to be more variable, and this improves distribution; in stronger winds the direction is more constant and the sideways spread of fertiliser sometimes suffers, whereas the spread along the direction of wind improves.

The effect of the particle size of the material blown was studied by examining the original material and that taken at various distances from the point of blowing. These separations into fractions of varying fineness were done at the Rukuhia Soil Research Station, Hamilton.

Method of Measuring Distribution

In each trial a large number of cardboard boxes of known area was set out in a grid at measured distances from the blower. The boxes were close together near the machine and $\frac{1}{2}$ to 1 chain apart at the extreme distances of spread. Each box collected an area of 1.5 sq. ft. and was lined with waxed paper, the lining being removed from the boxes with the collected fertiliser for weighing. This procedure was necessary because fine material adhered to the sides of unlined boxes and to canvas catchers and could not be removed satisfactorily.

Comparison of Machines

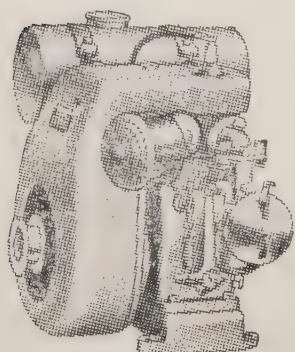
The four machines were compared using basic slag and superphosphate “fines.” Complete details are given of only the basic slag trials, as the superphosphate “fines” were found to be a much less satisfactory material for

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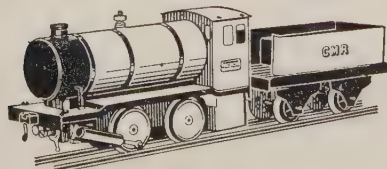
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blower distribution. Through each machine was blown $1\frac{1}{2}$ cwt. of basic slag, the outlet pipe being pointed across wind. Table 1 gives some of the details of these trials.

The "percentage accounted for" figure is calculated from the amount of material falling within the area receiving $\frac{1}{2}$ cwt. per acre or more. For example, 40 per cent. of the $1\frac{1}{2}$ cwt. of basic slag put through machine A (or $\frac{1}{2}$ cwt.) fell in this area, the remainder being unaccounted for; presumably most of it became air-borne and moved away in the dust cloud to an undetermined distance, though catchers were placed beyond the point where a measurable amount of material was trapped. However, the accuracy of this figure is difficult to assess. Any loss occasioned in the collecting and weighing of fertiliser would tend to reduce the "percentage accounted for", but the greatest care was taken. Again, the measurement of the area of highest density was often not precise, and this area accounts for a high proportion of the total measured quantity. Nevertheless, with fertiliser containing much coarse material almost 100 per cent. can be accounted for, so the technique of measuring distribution would appear reasonably efficient.

There appears to be no means of determining where the material which could not be accounted for in the collecting boxes was deposited. There is every possibility that a considerable proportion of the topdressing would fall within the limits of a large paddock, but observation from aircraft indicates that, under certain conditions, dust clouds from blower topdressers may be traced across country for several miles. Therefore the inference is not that all the fertiliser not accounted for is wasted, but rather that the operator of a blower-type topdresser has no practical means of controlling the area of deposition of this fraction of the material.

Machines A and D are of lower power than B and C. A considerably longer time was necessary to put the same amount of material through machines A and D, but the area receiving $\frac{1}{2}$ cwt. per acre or more was greater with these machines than with B and C, while the mean application rate was correspondingly less, as the same quantity of slag was put through each machine. Therefore, variations in wind speed and direction operating over a longer period with the low-powered machines seem to have resulted in a better spread of fertiliser.

Table 2 presents in a simplified form the details of distribution shown by Fig. 1. For example, it shows that, in the results for machine A, of the total area enclosed by the line representing $\frac{1}{2}$ cwt. per acre or more (that is, 0.28 acre) 60.2 per cent. is covered by a dressing of between $\frac{1}{4}$ and 1cwt. per

BLOWER TOPDRESSER TRIALS

Fig. 1—Spread of Basic Slag with Four Machines

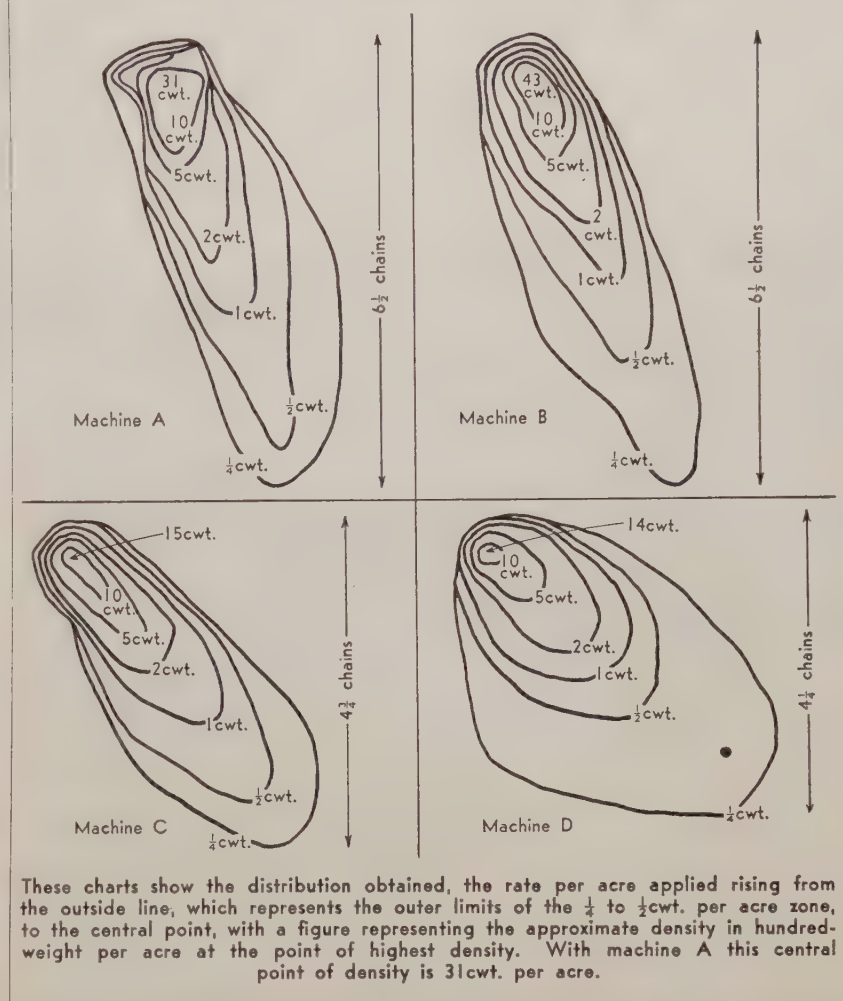


TABLE 2: SPREAD OF BASIC SLAG

Machine	Application rate (cwt. per acre)	Percentage of area covered	Percentage of weight applied
A	$\frac{1}{4}$ to 1	60.2	16.0
	1 to 5	29.1	34.0
	More than 5	10.7	50.0
B	$\frac{1}{4}$ to 1	66.2	14.0
	1 to 5	24.4	24.6
	More than 5	9.4	61.4
C	$\frac{1}{4}$ to 1	64.5	18.9
	1 to 5	27.7	40.5
	More than 5	7.8	40.6
D	$\frac{1}{4}$ to 1	70.8	29.0
	1 to 5	24.3	50.0
	More than 5	4.9	21.0

TABLE 1: BASIC SLAG TRIALS

Machine	Time taken	Average wind speed (m.p.h.)	Percentage of fertiliser accounted for	Area receiving $\frac{1}{2}$ cwt. per acre or more (acres)	Mean rate on area receiving $\frac{1}{2}$ cwt. or more (cwt. per acre)
A	3min. 50sec.	6.5	40.2	0.28	1.9
B	2min. 30sec.	7	45	0.23	2.4
C	2min. 30sec.	9.4	31	0.23	2.1
D	3min. 38sec.	8.2	31	0.32	1.2

acre, but this represents only 16 per cent. of the weight of fertiliser applied to the total area. This is not 16 per cent. of the total quantity put through the blower ($1\frac{1}{2}$ cwt.), but only 16 per cent. of the 40.2 per cent. of that amount that was accounted for.

If a rate of between 1 and 5cwt. per acre may be considered satisfactory, it is seen that this rate was applied to between 24.3 and 29.1 per cent. of the total area treated and that this represents between 24.6 and 50 per cent. of the total weight of basic slag accounted for. Between 21 and 61.4 per cent. of the weight of basic slag measured fell on an area of only 4.9 to 10.7 per cent. of the total area, giving a mean application rate well above 5cwt. per acre. In this respect machine D (one of the lower-powered machines) seems to have been more efficient than the other three, but this would appear to be somewhat of a chance effect which was not confirmed by other trials.

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The performances of the machines using basic slag may be summarised as follows:—

In all cases at least 50 per cent. of the basic slag could not be accounted for. Apparently it became air-borne and passed beyond the range of the collecting area. At all events this 50 per cent. was not deposited in the vicinity of the collecting area to give a mean density exceeding $\frac{1}{4}$ cwt. per acre.

The lower-powered machines took longer to distribute the same weight of material, but the area covered (at a rate of $\frac{1}{4}$ cwt. per acre or more) was greater than that covered by the higher-powered machines. This effect is probably a result of a greater chance of variability in wind speed and direction during the longer period of blowing.

With all machines more than 60 per cent. of the area receiving more than $\frac{1}{4}$ cwt. per acre was dressed with between $\frac{1}{4}$ and 1 cwt. per acre, and between 4.9 and 10.7 per cent. received more than 5 cwt. per acre. On the other hand, up to 61.4 per cent. of the total weight of basic slag accounted for fell on the small area which received more than 5 cwt. per acre. Such distribution cannot be considered satisfactory.

No marked superiority can be claimed for any machine, though machine D gave somewhat better results than the other three with basic slag. However, this result was not confirmed by the trials using superphosphate "fines" (an unsatisfactory material for blowing) in which the following figures were secured:—

TABLE 3: SPREAD OF SUPERPHOSPHATE "FINES"

Machine	Application rate (cwt. per acre)	Percentage of area covered	Percentage of weight applied
A	$\frac{1}{4}$ to 1	71.3	15.3
	1 to 5	20.1	22.5
	More than 5	8.6	62.2
B	$\frac{1}{4}$ to 1	67.7	19.5
	1 to 5	24.1	32.5
	More than 5	8.2	48.0
C	$\frac{1}{4}$ to 1	58.9	4.4
	1 to 5	15.2	6.1
	More than 5	25.9	89.5
D	$\frac{1}{4}$ to 1	49.0	3.4
	1 to 5	31.0	14.2
	More than 5	20.0	82.4

On the evidence available the four machines tested do not differ markedly in efficiency of fertiliser distribution, though in constructional details and probable length of efficient service they show great variation. Such details of mechanical construction can readily be assessed by examination.

Spread of Fertilisers and Lime

The main series of trials to compare results with different fertilisers was carried out with machine C, and details are given in Table 4. In all cases the rates blown were calculated on about 1 cwt. of material for each blow, and blowing was directed across wind for all materials except superphosphate "fines".

... BLOWER TOPDRESSER TRIALS

TABLE 4: COMPARISON OF RESULTS WITH FERTILISERS AND LIME (MACHINE C)

Fertiliser used	Time taken	Average wind speed (m.p.h.)	Percentage of fertiliser accounted for	Area receiving $\frac{1}{4}$ cwt. per acre or more (acres)	Mean rate on area receiving $\frac{1}{4}$ cwt. or more (cwt. per acre)
Superphosphate "fines" ..	1 min. 10 sec.	6	97	0.15	6.3
Basic slag ..	2 min. 30 sec.	9.4	31	0.23	2.1
Heskett slag ..	2 min. 54 sec.	6	17	0.18	0.9
Superphosphate ..	2 min. 26 sec.	8.6	100	0.18	5.7
Lime ..	2 min. 30 sec.	10	37	0.14	2.5
Reverted superphosphate ..	1 min. 38 sec.	14	82	0.17	4.8

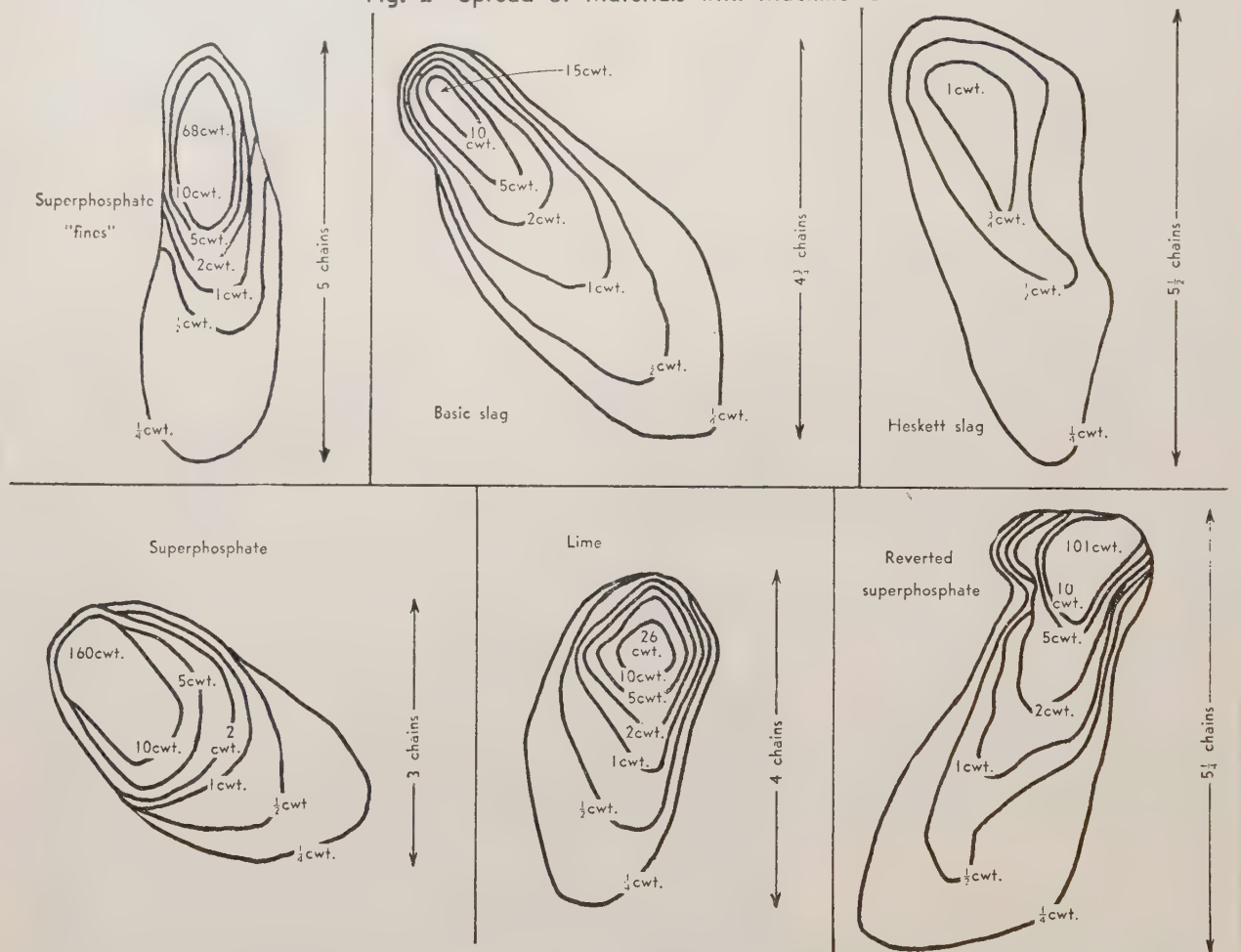


One of the four machines used in the trials blowing superphosphate "fines", which is superphosphate from which have been removed all particles not passing a sieve with 8 meshes to the linear inch.

TABLE 5: COMPARISON OF SPREAD OF FERTILISERS AND LIME (MACHINE C)

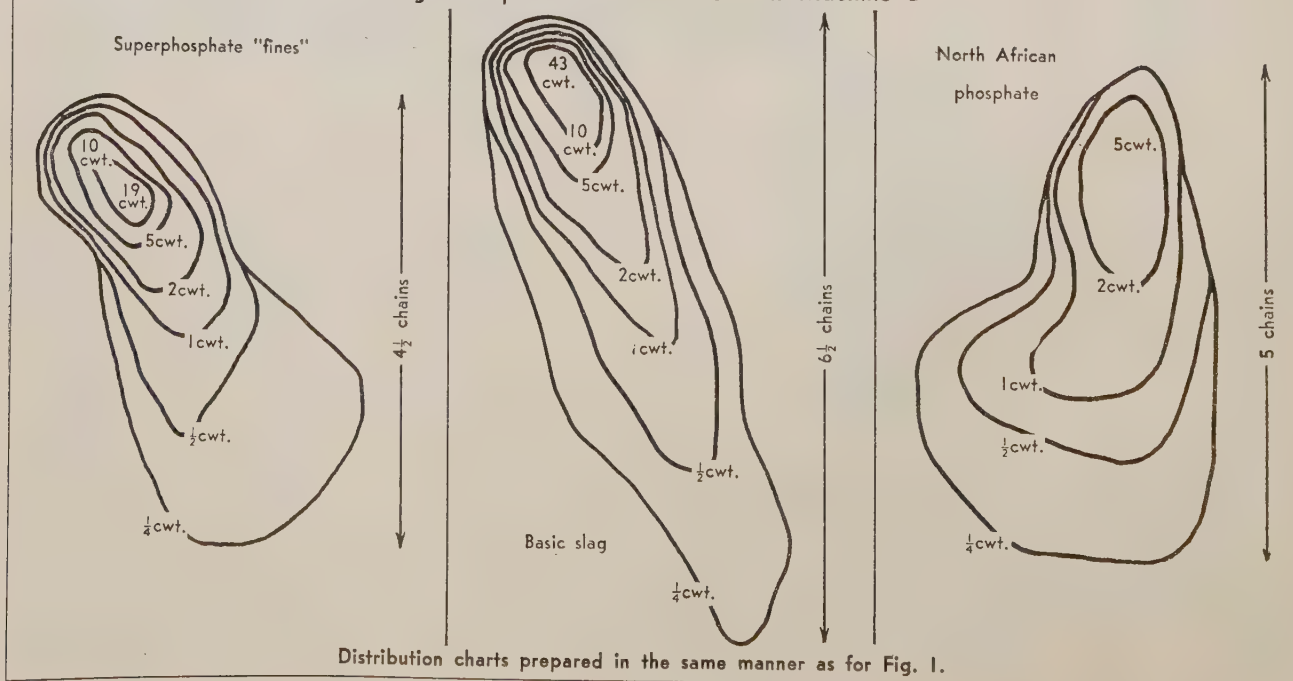
Fertiliser	Application rate (cwt. per acre)	Percentage of area covered	Percentage of weight applied
Superphosphate "fines" ..	$\frac{1}{4}$ to 1	58.9	4.1
	1 to 5	15.2	6.1
	More than 5	25.9	89.5
Basic slag	$\frac{1}{4}$ to 1	64.5	18.9
	1 to 5	27.7	40.5
	More than 5	7.8	40.6
Heskett slag	$\frac{1}{4}$ to 1	100.0	100.0
	1 to 5	Nil	Nil
	More than 5	Nil	Nil
Superphosphate	$\frac{1}{4}$ to 1	41.6	1.0
	1 to 5	24.2	9.5
	More than 5	34.2	89.5
Lime	$\frac{1}{4}$ to 1	70.8	17.6
	1 to 5	10.7	24.6
	More than 5	18.5	57.8
Reverted superphosphate ..	$\frac{1}{4}$ to 1	57.0	4.7
	1 to 5	29.0	6.7
	More than 5	14.0	88.6

Fig. 2—Spread of Materials with Machine C



Distribution charts prepared in the same manner as for Fig. 1.

Fig. 3—Spread of Materials with Machine B



Distribution charts prepared in the same manner as for Fig. 1.

The superphosphate "fines" and reverted superphosphates were put through the machine more rapidly than the other materials and might have given slightly better distribution if put through more slowly. However, the results do not differ greatly from those of superphosphate and lime, both of which contain much coarse material and were put through slowly.

The "percentage accounted for" figures show that almost all the superphosphate "fines" and superphosphate and most of the reverted superphosphate could be accounted for. At the other extreme 83 per cent. of the Heskett slag was not accounted for. The figure for lime (37 per cent.) is probably too low; no catcher was in the area where some of the heaviest deposition of lime occurred.

Basic slag covered the greatest area with a measurable deposition of fertiliser. The coarser materials, covering smaller areas, show much higher mean application rates per acre. Heskett slag shows a very low mean density; to obtain a measurable spread, 3½ cwt. of Heskett slag was put through the blower, and the figures quoted are adjusted to a 1 cwt. basis. The mean application rate, and to some extent the area receiving a measurable amount of fertiliser, can be increased by putting through more material at each blow, but that does not affect the proportional changes in density of fertiliser applied. It was not possible to find a definite relation between these two factors, but if a mean application rate of 2 cwt. per acre is aimed at, the area receiving ½ cwt. per acre or more would be considerably less than that shown for superphosphate "fines", superphosphate, and reverted superphosphate, and considerably greater for Heskett slag. However, the apparent loss of material shown by the "percentage accounted for" figures has also to be taken into account when considering fertilisers such as Heskett slag.

Table 5, which gives a condensation of the details of distribution of fertilisers shown in Fig. 2, presents some striking differences. Superphosphate, superphosphate "fines", and reverted superphosphate gave very similar results, 88 to 89 per cent. of the material being deposited in an area between 14 and 34.2 per cent. of the

... BLOWER TOPDRESSER TRIALS
TABLE 8: SPREAD OF BASIC SLAG FROM MOVING BLOWERS

	MACHINE B		MACHINE D	
	Density (cwt. per acre)	Distance from blower (chains)	Density (cwt. per acre)	Distance from blower (chains)
Machine moving at right angles to direction of of blowing	1.8	½	1.1	½
	1.9	½	1.0	½
	0.9	½	0.9	½
	0.5	1	0.6	1
	0.3	1½	0.4	1½
	0.2	1½	0.2	1½
	0.2	1½	0.2	1½
Machine moving at an angle of 45 degrees to direction of blowing	2.4	½	1.8	½
	1.6	½	1.1	½
	0.6	½	0.7	½
	0.4	1	0.4	1
	0.2	1½	0.3	1½
	0.2	1½	0.2	1½
	0.1	1½	0.1	1½

total, to give a mean application rate of more than 5 cwt. per acre. The distribution of lime was probably worse than appears in the table because the heaviest deposition was missed by the collecting boxes; it would probably be more truly shown by a distribution similar to the superphosphate group. At the other extreme Heskett slag showed no area of heavy deposition, but this effect must be considered in relation to the fact that only 17 per cent. of the fertiliser blown could be accounted for. Basic slag was intermediate in behaviour and showed a more even deposition than all other materials but Heskett slag.

Another series of trials, using machine B, included ground North African phosphate. Table 6 gives details of the trials and Table 7 and Fig. 3 details of the spread. The superphosphate "fines" were blown down wind and the other fertilisers across wind.

With superphosphate "fines", as with lime, the maximum density could not be estimated accurately and the "percentage accounted for" probably should be much higher than that shown. With North African phosphate only a small proportion could be accounted for, but the area topdressed effectively is about the same for the three fertilisers. The North African phosphate did not give the heavy central zone of deposition and approached Heskett slag in behaviour when blown, but it was blown in a considerably stronger wind.

Blowing from a Moving Machine

The graphs illustrating this article show the distribution of fertiliser when the blowing machines were stationary. However, many operators distribute fertiliser from machines mounted on lorries or sledges so that they are continuously in motion when spreading. The distribution patterns have been used to determine what the spread of fertiliser would be in such circumstances.

Two types of patterns were used, both involving the distribution of basic slag. They are those shown in Fig. 1 for machine B and machine D. The first is the long, narrow distribution with the wind relatively constant in direction and represents a blowing time of 2 minutes 30 seconds; 45 per cent. of the basic slag put through the machine could be accounted for. The pattern for machine D shows a wide dispersion with the wind direction variable and a blowing time of 3 minutes 38 seconds; only 31 per cent. of the basic slag was accounted for in the collecting boxes.

A constant speed of 1 mile per hour was assumed for the blower machine and calculations have been made for the machine travelling at right angles to the wind direction (direction of blowing) and for the machine moving at an angle of 45 degrees to the wind direction.

Table 8 shows the distribution obtained in these circumstances. It cannot be considered satisfactory. Even if all the fertiliser was accounted for, the rate of deposition 1½ chains from the blower would be only about ½ cwt. per acre. Considerably more fertiliser falls within ½ chain of the blower than further away, and the unevenness of deposition per unit of area is not overcome by keeping the blower in motion. Moreover, the figures show that the output of the machines is not sufficient for this method of distribution to be satisfactory, and blowing from a series of fixed points for 2 to 3 minutes at each is probably better.

Effect of Particle Size

The mechanical analysis figures presented in Table 9 have been considerably simplified for ease of presentation. In most cases the figures given are means of two or more samples representative of the zone of deposition indicated. The expression "mm" represents a screen (B.S.S.) with a specific number of meshes to the linear inch; for example, 60 mm = 60 mesh.

TABLE 6: COMPARISON OF RESULTS WITH FERTILISERS (MACHINE B)

Fertiliser used	Time taken	Average wind speed (m.p.h.)	Percentage of fertiliser accounted for	Area receiving ½ cwt. per acre or more (acres)	Mean rate on area receiving ½ cwt. or more (cwt. per acre)
Superphosphate "fines" ..	2 min. 30 sec.	6	34	0.2	1.7
Basic slag ..	2 min. 30 sec.	7	45	0.23	2.4
North African phosphate ..	2 min. 25 sec.	17.9	27	0.2	1.4

TABLE 7: COMPARISON OF SPREAD OF FERTILISERS (MACHINE B)

Fertiliser	Application rate (cwt. per acre)	Percentage of area covered	Percentage of weight applied
Superphosphate "fines" ..	½ to 1	67.7	20.6
	1 to 5	24.1	32.4
	More than 5	8.2	47.0
Basic slag	½ to 1	66.2	14.0
	1 to 5	24.4	24.6
	More than 5	9.4	61.4
North African phosphate ..	½ to 1	77.7	43.0
	1 to 5	22.3	57.0
	More than 5	Nil	Nil

BLOWER TOPDRESSER TRIALS . . .

TABLE 9: PARTICLE-SIZE DISTRIBUTION OF FERTILISERS AND LIME

Fertiliser and where collected	Particle distribution (percentage in each class)			
	Retained by 8 mm	Passing 8 mm, retained by 60 mm	Passing 60 mm retained by 120 mm	Passing 120 mm
Superphosphate "fines"—				
Original material	1.0	75.0	16.0	8.0
In ¼ to 1cwt. zone	Nil	13.0	72.6	14.4
In 1 to 5cwt. zone	Nil	36.0	54.8	9.2
In more than 5cwt. zone ..	0.5	92.0	7.5	1.0
Basic slag—				
Original material	Nil	3.8	23.8	72.4
In ¼ to 1cwt. zone	Nil	No sample		
In 1 to 5cwt. zone	Nil	0.5	45.5	54.0
In more than 5cwt. zone ..	Nil	13.6	51.3	35.1
Superphosphate—				
Original material	35.0	50.1	11.5	3.4
In ¼ to 1cwt. zone	Nil	Nil	59.6	40.4
In 1 to 5cwt. zone	Nil	21.5	65.9	12.6
In more than 5cwt. zone ..	10.5	76.6	11.0	1.9
Lime—				
Original material	Nil	67.7	10.3	22.0
In ¼ to 1cwt. zone	Nil	6.0	46.7	47.3
In 1 to 5cwt. zone	0.3	40.0	45.3	14.4
In more than 5cwt. zone ..	0.1	94.0	4.6	1.3
Heskett slag—				
Original material	Nil	48.2	38.5	13.3
Reverted superphosphate—				
Original material	5.3	67.2	26.3	1.2
In ¼ to 1cwt. zone	Nil	76.6	11.7	11.7
In 1 to 5cwt. zone	Nil	25.6	59.5	14.9
In more than 5cwt. zone ..	23.2	63.4	11.6	1.8
North African phosphate—				
Original material	Nil	13.2	61.6	25.2
In ¼ to 1cwt. zone	Nil	Nil	33.0	67.0
In 1 to 5cwt. zone	Nil	7.0	48.5	44.5
In more than 5cwt. zone ..	Nil	Nil	64.9	35.1

This table shows that the materials giving the poorest distribution (superphosphate "fines", superphosphate, and reverted superphosphate) have only a negligible proportion of material passing the 120-mesh sieve; basic slag has the highest amount, and North African phosphate is intermediate. Heskett slag has an unexpectedly low percentage in this category in view of the high proportion that becomes airborne; it is likely that individual particles of this material are lighter than those of basic slag, for both weight (specific gravity) and fineness are probably important factors.

The distribution of the material into the various zones indicates the winnowing effect of the blower, the finer particles being concentrated in the areas furthest from the machine. For example, 75 per cent. of the original superphosphate "fines" was retained on the 60-mesh sieve, but of the material collected in the ¼ to 1cwt. per acre zone only 13 per cent. was in this category. Conversely, in the more than 5cwt. per acre zone, 92 per cent. of the fertiliser did not pass the 60-mesh sieve.

The figures for all materials except Heskett slag show that a fineness of grinding sufficient to give particles of such size that most of them pass the 60-mesh sieve and a considerable proportion pass the 120-mesh sieve is desirable for fertilisers used with blower-type topdressers. Such materials should contain no coarse particles. However, the removal of particles retained on the 8-mm sieve did not improve the distribution of superphosphate, as is shown by the spread of superphosphate "fines"; the separation should have discarded in addition particles retained on the 60-mesh screen.

A suggested specification for most materials for use with blower-type topdressers would be: "All material to pass the 60-mesh B.S.S. screen and at least 25 per cent. to pass the 120-mesh B.S.S. screen". However, a high proportion of such finely ground material would be very likely to become airborne, and little or no control of the area of final deposition of this proportion would be possible.

So the paradox of blower distribution of fertilisers is that, though the area of deposition of relatively coarse materials can be controlled fairly effectively, the spread of such materials is grossly uneven. Conversely, the spread of finely ground materials is reasonably good, but there is very little control over the area on which such materials are deposited.

Nevertheless, it is possible that a certain degree of fineness for each class of material blown might be found to provide good distribution with a blower-type topdresser and yet prevent unduly high loss in the dust cloud. Some indication of the probable specification for such material has been given, but further detailed trials using materials screened to various finenesses are proposed to test this assumption more precisely.

Acknowledgment

The co-operation of the firms which made their machines available on loan to the Department for these trials is acknowledged.

A Romney Ewe with Six Lambs



A Romney ewe with her six lambs on the property of Mr. J. A. Russell, Blythwood, Feilding.

The ewe lambled normally and all the lambs lived for 24 hours, though three died later. The lambs varied from 3½ to 5lb. and their total weight was 23½lb.

—H. O. MACKLEY, Inspector of Stock,

Department of Agriculture, Feilding.

The Household Poultry Keeper should not Neglect Culling

HOUSEHOLD poultry keepers tend to treat all birds as if they were equally good, but pullets and hens vary just as much in their abilities as people. Though outward appearance is not a complete guide to ability and performance, exterior signs often give a true indication. The amateur poultry keeper should not neglect regular culling of hens and older pullets, and that work is described in this month's article by W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton.

CULLING leaves the remaining birds more space in the henhouse, less crowded perches, cooler quarters during warm nights, and more feeding room around troughs and hoppers, and reduces bullying. Eliminating the poor producer saves money because unprofitable layers are no longer permitted to eat valuable food without giving a return. The observant person can learn much about poultry by handling the birds individually and culling is one part of poultry work which shows results quickly. It leads to the habit of constantly observing the quality and condition of the flock, and even strengthens the desire to see better birds.

In its full meaning the term "culling" covers any dividing of the flock into groups by classification of types, but the word has come to mean in more popular parlance the eliminating of a group inferior in quality. In this article culling is considered in this restricted sense, dealing with the uneconomic bird which should be rejected; next month's article will deal with the profitable hen which should be retained for a further laying year.

The aim of culling is to eliminate the poor producers so that almost as many eggs are obtained immediately afterward from fewer birds and less food.

Systematic culling may be carried out in two ways—by trap-nest or individual laying-cage records, which is the best and most accurate method, but few householders go to the expense and trouble involved; and by external characters.

Influence of Management

Even an experienced culler cannot be thoroughly efficient if he is not aware of adverse conditions under which the fowls have been kept. Culling cannot be accurate unless feeding, housing, and management have been such that good birds should lay. Many hens do not lay solely because they are not physically capable of doing so under existing conditions, even though otherwise they may be naturally productive. Under such conditions removing all unproductive fowls might cause the culling of valuable birds. If the culler knows of any special cause for a setback in production, he

can make allowance for it and cull less severely. If proper care has been given the hens, they may be culled at any time; if not, they should be placed under desirable conditions at once and culling left for 4 to 6 weeks.

A place or coop must be prepared for the culls. The hens should be confined to their house the night before, and catching equipment must be in order. Fowls near the end of their laying period are usually very "touchy" and must be caught quietly.

A heavy-breed hen that has been broody recently, though perhaps not laying, should not be culled at this time unless it has been broody several times. Light-breed fowls that go broody should not be retained. Sick birds should be culled, as most of them do not lay.

A person learning culling must catch and pick up every fowl for examination, but experience soon enables the culler to select only the birds he needs. He will find that he catches very few hens without cause.

Evidence of Egg Production

The first step in culling is to examine the general appearance of all the fowls while they are standing on the floor, a watch being kept for the characters which indicate whether a hen is in production or not. At this time of year it is not necessary to distinguish between hens and pullets. The birds which are in their first laying year are still pullets technically, but they are so near to their moulting period that they can be considered as hens for the purposes of culling.

The characters which indicate egg production are the comb, legs, plumage, vent, and pelvic bones. If any character is not as pronouncedly good or bad as to make a decision easy, it should be checked with the other points and the decision formulated from the over-all picture.

The comb is the chief guide because it is the exterior reflection of the activity of the ovary. If the ovary system is active, the comb is well served with blood and is red, full, soft, and pliable. When the hen is about to stop laying the glandular system effects a control which causes a reduced flow of blood to the comb,



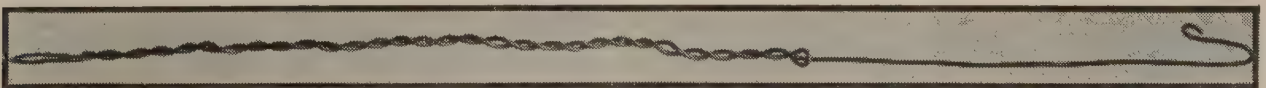
[Fraser Niederer photo.]

A 1½-year-old crossbred laying pullet nearing the end of her laying season. The excellent layer is not penalised for untidiness. It has worked too hard to remain neat in feathering.

which then loses much of its red colour, becomes dry in appearance, and shrivels. Instead of hanging well over to one side it may even reduce so much in size that it stands upright.

Then it is necessary to judge whether the condition of the comb indicates that the hen is completely out of production or is slowing up in laying. The bird should be caught and the feathers on the abdomen parted so that the vent is exposed. The vent of a bird that is not laying is dry, puckered, and reduced in size; that of a hen in lay is larger and moist.

Another confirmation may be obtained by feeling the pelvic (or pubic) bones. These are the two bones just below and on either side of the vent. If they are close together, and especially if they are thick, blunt, and rigid, the hen is not laying. A fowl that has been off the lay for some time stores up fat in the abdomen and around the pelvic bones. The space between the pelvis is measured in terms of and by the fingers. With light-breed fowls a three-finger span or greater indicates heavy laying, a two-finger span shows laying, a span of one and a half fingers means low or even no production, and a one-finger span indicates the out-of-lay bird. The spacing varies with breeds and is less in heavy breeds or cross-breeds; with them a finger and a half span usually means that the bird is still in average lay.



A useful and easily made hook for catching adult fowls.

[Fraser Niederer photo.]

CULLING HOUSEHOLD POULTRY FOR EGG PRODUCTION



[Fraser Niederer photo.]

A producer of moderate worth still in lay.

The next signs to be looked for are those of a moult among the neck and body feathers. Pin feathers or new feathers may be growing in to take the place of those being dropped. New feathers are bright, and many of the newer ones will have blood in the bases of the quills, which will be fairly soft. Old quills are dry and hard at the bases. A hen shedding feathers at this time is almost certain to be off the lay.

The colour of the shanks is another guide in yellow-legged varieties, of which the Leghorn is the best known. A bird which is not using the yellow colouring matter in heavy egg production to tint the yolks stores up a reserve in its shanks. A heavily laying Leghorn has pale legs, so when the colouring is seen to be coming back to the legs it is certain that the bird has been off the lay for some time. It should have been culled earlier and was missed on a previous cull. Leghorn pullets before they reach maturity and before they begin to lay should have bright yellow legs. If this colour is a long time disappearing, the pullet is only a slow pro-



[Fraser Niederer photo.]

A low producer about to stop laying.

ducer. The heavy layer loses leg colour rapidly.

Another characteristic which assists in judging laying ability is the abdomen. A shrunken, "tucked-up" abdomen or one filled with a hard material or with the intestines well covered with fat is a poor sign.

All these characters will not be clear in every bird or in as obvious a form as described. Culling hens calls for balancing characters, and a bird should not be discarded on the basis of one bad character alone. The birds must be judged by comparison of special features not with those of the best members of the flock but with those of the average. All the evidence should be weighed, even the behaviour of the hen. Does it feed avidly and exercise well, or does it mope about the corners during the day or stay up on the perch at feeding time? Each symptom in itself may be only circumstantial, but if several links fit together to form a chain of evidence against it, the bird should be culled out.

Though this time of year is one of the most important for a major cull, culling should be done all the time, poor layers being rejected as fast as they are recognised. Another major cull will be needed in a few weeks.

Sick Birds

Sick fowls present a difficult problem to householders. If a bird is obviously ill, and not merely off its appetite for the day, a quick decision must be made. If an examination shows that it has lost condition on breast and keel, it should be killed immediately and no further time wasted on it, but a bird which is well fleshed and empty in crop and abdomen should be put in an observation coop. Should the crop be empty but the abdomen full, a cyst or a growth should be suspected and the bird killed. Knowing each fowl by name should not be allowed to lead to the exercising of too much sympathy and giving sick birds a chance to recover.



THE danger of repairing, lubricating, or closely inspecting machinery that is in motion is still not fully realised, as is evident from the associated accidents that still occur. Crushed and mangled fingers, arms, and legs result from such accidents, but operators continue to take unnecessary risks. Loose clothing (for instance, the sleeves in the illustration) also constitutes a hazard that is not fully realised to a person working machinery. Loose and ill-fitting coats, ragged sleeves, and loose and frayed pullovers and cuffs on trousers help to cause accidents. Farm clothing should be neatly fitting but not tight, and overalls or boiler-suits worn over other clothing are a big step forward in the field of accident prevention. Women farm workers are well advised to wear hair-nets to avoid the danger of being scalped as a result of long hair being caught in moving shafts, pulleys, and belts.

Never service machinery in motion and wear working clothes that fit neatly.

—C. J. CROSBIE, Farm Machinery Instructor,
Department of Agriculture, Christchurch.

The Home Garden in February

By H. P. THOMAS, Vegetable Instructor,
Department of Agriculture, Wanganui.

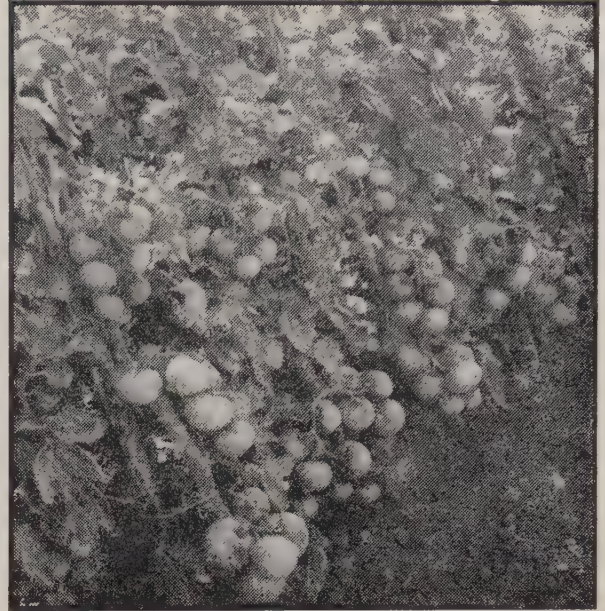
IF earlier sowings have been well planned, gardens should now contain a varied supply of vegetables from which fresh produce may be harvested daily. However, it is still necessary to keep up the succession of monthly plantings as ground becomes available; general plantings in two seasons (spring and early autumn) will be necessary to keep up the yearly supply.

PROVISION for winter supplies begins with the sowing of seeds from October onward. Planting out of seedlings may start in December. Quick-maturing kinds such as early peas, carrots, lettuce, summer cabbage, cauliflower, etc., which were planted in spring, will have been harvested and they should have been followed by main-crop varieties. The succession should be maintained by growing crops of the kinds often termed winter greens, which mature through the winter, and by sowing or planting in autumn to produce early-spring vegetables.

Spring planting generally receives greatest attention from the average gardener, with the result that an amount in excess of the home garden requirements is ready to be harvested in summer. This is why monthly plantings of small numbers of plants and seeds are recommended. The over-supply in summer is often wasted. It gives the gardener a false sense of security, and the necessary plantings for winter production are often forgotten or considerably delayed. If sufficient sowings and plantings have been made in autumn for winter vegetables, there will be less need to sow seeds early in the spring, when conditions are not always suitable for germination and growth. Should plantings of winter greens be small or if they were omitted because of adverse conditions, lack of ground, or other circumstances, plant as early as possible in February any of the following: Savoy cabbage (Drumhead or Omega); broccoli (Veitch's Self Protecting, early, Mammoth, or Winter White); borecole (Tall or Dwarf Green Curled); leek (London Flag or Musselburgh); celery (Golden Self Blanching or White Plume).



[Green and Hahn Ltd. photo.]
Silver beet is a hardy, nutritious plant. In most districts a February sowing will provide greens throughout late winter and spring if plants can be established satisfactorily.



[Sparrow Industrial Pictures Ltd. photo.]
An excellent crop of tomatoes, the result of careful staking, pruning, manuring, and spraying.

In districts where a relatively short autumn is experienced the ultimate crop will depend largely on weather conditions. Recent sowings of beetroot, parsnip, turnip, lettuce, swede, etc., will probably need thinning. As crowding creates inferior, weak plants, thinning out should begin as soon as the plants are large enough to handle. Regular weekly hoeing should be maintained to eliminate weeds and assist aeration. Frequent harvesting of peas, beans, cucumbers, and tomatoes will prolong the picking season and encourage further fruiting. Most crops, particularly lettuce, spinach, silver beet, cabbage, and cauliflower, will benefit from regular application of liquid manure.

Liquid Manure

Liquid manure may be made with most well-rotted animal excreta, cow and horse manure being particularly suitable, by enclosing a quantity of the manure loosely in a fairly open piece of sacking and suspending it in a drum or barrel of water.

Chimney soot often contains a small percentage of nitrogen and may be included in the liquid manure in the same way as animal manure. After a few days the water will become the colour of weak tea, and it is then ready for use. Should the liquid manure be stronger than this, it could be diluted.

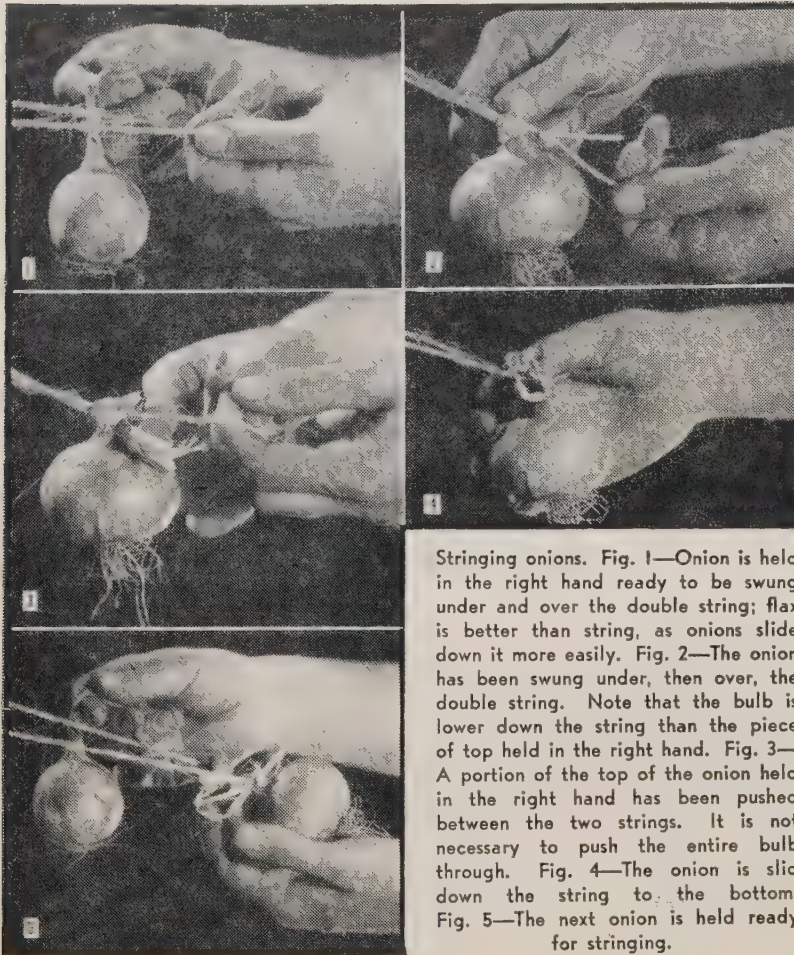
As the liquid is used, more water may be added, but this process should not be carried on indefinitely. After the container has been refilled twice a new supply of manure and soot should be provided. When applying liquid manure, thoroughly saturate the soil with water, particularly if it is dry. As a supplier of nitrogen in a readily available form liquid manure is of great value to many vegetable plants, especially during their early growth. Nitrate of soda or sulphate of ammonia (1oz. to 4 gallons of water) may be used as a substitute if animal manure is not available.

Digging Spare Ground

As harvesting progresses, and when sufficient provision has been made for the winter supply, any spare ground should be dug over.

It may be left in a rough state to benefit by weathering agents during winter or it may be sown with some good type of green crop, such as mustard, vetches, lupin, oats, and barley. Green manuring is carried out to increase the amount of organic matter in the soil, thereby improving its texture and enabling it to retain moisture and plant food more readily. Lupins and vetches, being leguminous

THE HOME GARDEN IN FEBRUARY



Stringing onions. Fig. 1—Onion is held in the right hand ready to be swung under and over the double string; flax is better than string, as onions slide down it more easily. Fig. 2—The onion has been swung under, then over, the double string. Note that the bulb is lower down the string than the piece of top held in the right hand. Fig. 3—A portion of the top of the onion held in the right hand has been pushed between the two strings. It is not necessary to push the entire bulb through. Fig. 4—The onion is slid down the string to the bottom. Fig. 5—The next onion is held ready for stringing.

plants are valuable because of their added power of obtaining nitrogen from the air through the bacteria on their roots. It has been found that the bacteria in the soil compete with growing plants for plant food, particularly nitrogen, during the time they are engaged on breaking down the green manure into humus. The immediate result of digging in green organic matter is temporarily to diminish soil fertility, particularly if the soil naturally lacks humus and minerals. It is advisable to allow sufficient time to elapse between the turning under of a green crop and the planting of a subsequent crop to allow thorough decomposition of the organic matter. It is therefore an advantage when green cropping is considered to sow the crop during autumn. As this is not always possible, later sowings and digging in of crops should be accompanied by dusting the ground with a nitrogenous manure such as sulphate of ammonia at approximately ½ oz. per square yard. This assists decay and also prevents any temporary shortage of nitrogen due to the requirements of the bacteria engaged in decomposition.

For satisfactory results green manure crops should be vigorous and

succulent, and it is recommended that they be turned in not later than the first flowering stage. As most home gardens are lacking in organic matter owing to limited space and intensive cropping, it is most important to dig in any available material. All waste material from crops, annual weeds, soft hedge clippings, lawn clippings, kitchen refuse, and animal or fowl manure, etc., should be returned to the soil either via the compost heap or directly by digging it in. It is very unlikely that the average home gardener will ever be in the fortunate position of having available more organic material than his garden requires.

Cultivation

Every advantage should be taken of all fine weather to cultivate between growing crops. Light cultivation with a hoe should be frequent enough to check weeds, which, if left for any length of time, rob the plants of food and act as possible hosts for insect pests and diseases.

To avoid damage to roots cultivation near the plants should be shallow, but between the rows it may be

deeper. Moulding up is a sound practice, and it is now carried out with many vegetables. Moulding up forms ridges which give support during stormy weather and it also assists with soil drainage, which is often very necessary, particularly with winter crops in heavy soils.

Onions

Harvesting of onions is carried out in February in most districts, although there may be slight variation according to the season. If left in the ground too long, onions are liable to split and become discoloured, but on the other hand harvesting too early will impair their keeping qualities. The correct stage for lifting onions is when the bulbs stand well out of the ground and the foliage has lost its green colour and feels dry. Home gardeners can assist the drying of the bulbs by bending the tops over when they appear to have reached their maximum growth, usually about February. During the lifting, care must be taken not to bruise or injure bulbs, as damaged ones will quickly rot. If they are still firm in the ground, levering them up with a fork before they are pulled out will assist. Damage to the bases of the bulbs is likely to result if they are pulled out carelessly. On no account must they go into store immediately they are harvested. After removal they may be laid on their sides with their roots exposed to the sun. In wet weather they may need to be turned several times. In very dry areas bulbs when lifted may be left for a day or two on the land where they were growing.

Other methods useful for drying are:—

1. Lay the bulbs on sacks in a sunny position, removing them indoors each night or during showery weather.

2. During a spell of good weather spread onions on a wire netting frame or sheet of corrugated iron. In this way their removal to cover during unfavourable weather is much easier.

3. Spread out the bulbs in shallow boxes in a greenhouse, the ventilators of which can be kept wide open.

In each of the above instances frequent turning of the onions will assist in the ripening process. Onions must be stored in a dry, ventilated, frost-proof place. Damp or warm quarters are likely to induce rotting of the bulbs or premature sprouting. Bulbs with thick necks or those showing damage should be set aside for immediate use. A very necessary precaution is to burn all onion refuse and diseased bulbs. The practice of roping and suspending onions in a cool, airy place is a good method which has the advantage that a large number of onions can be stored in a small space in the best of conditions. Another good method is to sling the bulbs in a thin layer on nets or netting wire just high enough in the shed for them not to be in the way. This is a good way of keeping the bulbs in a sound condition for a long period.

For Next Year's Crop

Prepare the ground now for an autumn sowing of onions. Seed is generally sown during late February or early March in the South Island and late March or early April in the North Island. A good supply of

moisture is necessary early in their growth, with dry conditions following for ripening the bulbs.

To obtain strong plants spread and dig in some well-rotted compost plus a dressing of 2 parts of superphosphate and 1 part of sulphate of potash at 4oz. to the square yard. Slightly raised seed-beds may be made for good drainage, but the ground used should be tramped firm.

Varieties

Pukekohe Long Keeper is a widely grown variety, although Brown Spanish and Straw Spanish are quite suitable for autumn sowing.

Shallots

Shallots not already lifted can be harvested as soon as the foliage yellows and begins to die down. The use of a fork will assist the lifting and save damage if the ground is dry and hard. The lifted clumps may be left on the ground for several days if the weather is fine, so that the sun and air may dry the roots. An excellent way of drying clumps is to lay them on a length of wire netting erected 1ft. or so above the ground to allow the air to circulate round the bulbs. When dried the clumps need to be separated into individual bulbs, and these require to be sorted roughly. Some good bulbs may be set aside for planting next year's crop, and the smaller ones should be held for use in soups and stews. The balance should be further ripened for storage and then given conditions similar to those recommended for onions, or they may be spread out thinly on trays or benches.

Spring Cabbage

A sowing of cabbage seed now is important, as the object should be to have cabbages about July or shortly afterward, when there is usually a scarcity. A further sowing in approximately 3 weeks will also be

THE HOME GARDEN IN FEBRUARY



[Green and Hahn Ltd. photo.]

Making liquid manure; a bag of manure suspended in a 40-gallon drum of water.

desirable because of weather uncertainties. In the milder northern districts sowings can be left until March. Should both sowings and the subsequent plantings be successful, a succession of cabbages will be obtained at a time when they will be really appreciated. Seedsmen offer a wide choice of varieties. However, Flower of Spring is usually chosen for autumn sowing or planting. It withstands the unfavourable growing conditions of winter better than most varieties and in the improved conditions of spring it can usually be relied on to form a good heart. However, even with this type of cabbage, whether a good heart is formed depends on the stage of growth at which checks are received and the severity of the winter. The chief object is to have strong, sturdy plants to set out and for these to have sufficient time to become established before winter.

A good home garden practice is to plant spring cabbage in the land cleared of onions, potatoes, or peas. Immediately these crops have been cleared, the preparation of the land can be undertaken while the young plants are growing on.

Spread farmyard manure or compost liberally over the ground and fork this 6in. to 8in. into the soil.

A topdressing of 2 parts of blood and bone and 1 of superphosphate may be lightly worked in at 6oz. to the square yard. A topdressing of carbonate of lime at $\frac{1}{2}$ lb. per square yard would also prove beneficial where soils are acid.

The position selected for a seed-bed should not be any odd corner; it should be open and sunny, although it should preferably be sheltered from wind and rough southerly weather. In some districts it would be an advantage to sow seed in a raised bed. Sow the seed thinly $\frac{1}{4}$ in. deep in rows 12in.

apart in well-cultivated soil rich in humus. If the soil is lacking in humus, well-decayed organic material can be added, or if this is not available, blood and bone at the rate of 3oz. per square yard can be applied and thoroughly incorporated before sowing the seed.

Cauliflower

For an early supply of cauliflowers, seed of several varieties can be sown now for succession of maturity. Much care and attention are needed to produce good crops. Good-quality seed should be obtained and the plants should receive no check in growth. Extreme weather conditions during growth will check proper development and may result in premature "bolting" to seed or "buttoning" of heads. Liberal feeding, watering, and good drainage are essential. For raising the plants the same conditions apply as for spring cabbage. When transplanting, allow 18in. between plants and 2ft. to 2ft. 6in. between rows.

Varieties: The following varieties may be sown: Best of All, Early Snowball, All the Year Round, Phenomenal (5 months), Main Crop Phenomenal, Walcheren, and Veitch's Autumn Giant. Plants of Phenomenal Early may be planted out into their permanent positions this month.

Peas

Only in northern districts where autumn conditions are sufficiently mild to bring them to maturity should a sowing of peas be tried now. Sufficient moisture to facilitate prompt germination and rich soil in a sheltered, sunny aspect are also necessary for success.

Soaking seed overnight is helpful, especially if the soil is dry. Broad, flat drills 2in. to 3in. deep, usually made with the hoe, are advised, and the seed should be sown thinly.



[Sparrow Industrial Pictures Ltd. photo.] Onions are at the correct stage for lifting when the bulbs stand well out of the ground and the foliage has lost its green colour and feels dry.

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Lime is essential for peas on most soils, and an annual dressing of 3 to 4oz. per square yard may be necessary if it has not already been supplied. Too much nitrogen is likely to produce excess tip growth under normal growing conditions, but a dusting of nitrate of soda or sulphate of ammonia at the roots of the young plants at this time of the year will help them along. In preference to the dusting, 1oz. of either of the above manures to 4 gallons of water can be applied.

Quick-maturing dwarf varieties such as William Massey, Little Marvel, William Hurst, and English Wonder are the best to use if peas are wanted for Easter or thereabouts. William Massey is the most popular of these early varieties because of its adaptability to a wide range of soil and climate.

Turnips and Swedes

An autumn sowing of turnips as early as possible can be recommended. If birds are likely to be troublesome, dust the seed in red lead moistened with kerosene to act as a deterrent. It is said that turnip tops are much appreciated when there is little else in the way of fresh vegetables. Sow seed thinly $\frac{1}{2}$ in. deep in rows 15 in. apart.

Varieties: Early Milan Purple Top and Early White Milan are especially suitable for sowing at this time.

In northern districts where conditions are not too dry and a longer season is assured seed of swede turnip can also be sown.

Laing's Table is a popular garden variety.

Chives

Autumn or early spring is the best time to divide the clumps of chives for replanting or to make a new planting of these excellent substitutes for spring onions. They are very accommodating as to soil and are easy to grow. Clumps are very suitable for using as an edging plant in the vegetable garden. If more than one row



[Green and Hahn Ltd. photo.]

Borecole (curly or Scotch kale) is a reliable winter green crop. It is most appetising and is worthy of more attention in home gardens.

is desired, the spacing between rows should be 15 to 18 in., with 9 in. between clumps. Once a clump is planted it is not necessary to disturb it for 3 or 4 years if growth appears satisfactory. Frequent trimming of the foliage of established plants will produce new, tender growth which is desired for seasoning and salads.

Mustard and Cress

Mustard and cress are usually grown as spring and autumn salad plants, because they prefer moist, fertile soils,

with subsequent heavy waterings. However, where these conditions obtain, or can be provided artificially, they can be sown the whole year round. As cress takes longer to mature, it is advisable to sow it about 5 days before the mustard so that both will be ready for harvesting at the same time. These crops should be ready to cut for salads in 4 to 6 weeks from sowing. Seed may be broadcast thickly and covered with a sprinkling of fine soil. The soil should be kept moist to produce crisp, tender growth.

Potatoes

Unless main-crop potatoes are required for immediate use, they should not be dug when immature, as there is then every likelihood of considerable loss in storage. While top growth is healthy and vigorous tuber development will continue. Hoeing, weeding, and earthing up should continue as the tubers grow, and digging should not begin until the tops are yellow and withered. At maturity the skin of the tuber is firm, and will not rub off easily. If possible, lift the tubers carefully in dry weather, giving them a few hours to dry. In districts where potato moth is prevalent it is advisable to bag the potatoes and sew up the bags as soon as the potatoes have been dug.

Radishes

Radishes are perhaps the easiest vegetable to grow in the garden, although best results are obtained when they are grown in cool weather and in a soil with a high humus content and adequate moisture. Fresh animal manure should never be used. If the soil is not considered rich enough, blood and bone may be used at 2oz. per square yard. A position of partial shade alongside sweet corn or a similar tall-growing vegetable



[Sparrow Industrial Pictures Ltd. photo.]

While top growth of potatoes is healthy and vigorous tuber development will continue. Digging should not begin until the tops are yellow and withered.

THE HOME GARDEN IN FEBRUARY



A place for parsley should be found in every home garden. A sowing may be made now. [Green and Hahn Ltd. photo.]

is suggested. Excellent crops of crisp roots can then be assured. Successional sowings may be made from August to February, and in northern districts to March. Sow the seed thinly $\frac{1}{2}$ in. deep in rows, or broadcast it according to the amount required.

Varieties such as Scarlet Globe or French Breakfast would be preferable to the longer varieties for late sowings.

Parsley

A sowing of parsley may be made this month for winter and spring use. Parsley thrives in most good, moist garden soils. A dressing of blood and bone worked into the soil at 2 to 3oz. per square yard will increase the yield. Soaking the seed for a few hours in warm water before sowing will be helpful, particularly if the soil tends to be dry. As the seed germinates slowly, sometimes taking 4 to 6 weeks, some gardeners prefer to sow parsley in boxes and transplant it. In the garden sow seed thinly $\frac{1}{2}$ in. deep in rows 15in. to 18in. apart and later thin plants to 8in. apart. If desired, parsley can be sown broadcast in a convenient-sized bed and thinned out to the spacing recommended.

The outer and larger leaves should be removed successively from several plants in preference to stripping one plant, as this will induce the plants to continue producing better-quality leaves for several months.

Varieties: Those known as Extra Moss Curled and Treble Curled appear to be most popular.

Silver Beet, Spinach Beet, and Spinach

There are some excellent strains of silver beet (Swiss chard) on the market. The green leaves, which are a rich source of vitamins, are a great standby when other vegetables are likely to be scarce. In New Zealand the plants are grown mainly for their green leaves, but the succulent midribs of

some strains, if properly prepared for the table, are similar in flavour to that of sea kale.

Silver beet produces a heavy crop with a minimum of attention, and in most districts a February sowing will provide greens throughout late winter and spring if growing conditions in autumn are favourable for establishment.

Spinach Beet

Spinach beet is closely allied to silver beet, but can be harvested over a longer period. Being more tolerant of dry conditions and extreme changes of temperature, it will continue to produce a supply of nutritious leaves in hot summer weather, when true spinach is difficult to grow.

Sowing and after-care for both silver beet and spinach beet are the same. The soil should be well drained and well cultivated and preferably rich in humus. If the soil is acid, the application of 2 to 3oz. of lime per square yard will be of benefit to these crops.

The following manure at 3oz. per square yard will also be beneficial on most soils: Blood and bone or a mixture or 3 parts of superphosphate (by weight) to 1 part sulphate of ammonia. This should be broadcast and well worked into the soil before planting.

Seed should be sown $\frac{1}{2}$ in. deep in rows 18in. apart and the young plants later thinned to 9in. apart.

Plants which may have been raised from seed sown in January can be set out in a like manner.

Spinach

An initial sowing of the Prickly or Winter variety may now be made. The seed should be sown sparingly $\frac{1}{2}$ in. deep in rows 1ft. apart and the plants thinned later to 8in. apart. As quick growth is necessary to produce tender, succulent leaves, do not let plants suffer for want of water. Weekly

applications of liquid manure can be applied with advantage.

Tomatoes

Harvesting tomatoes will now be a pleasurable task in most gardens. When the foliage is heavy it is permissible at this time of the year to cut away some of the foliage covering the trusses of fruit. This assists ripening by letting in the sun and makes the spraying of the plants easier. Application of Bordeaux mixture or a similar suitable copper fungicide at about 14-day intervals is recommended for the prevention of fungous disease. Where tomato stem borer and looper caterpillar are troublesome arsenate of lead can be added at the rate of 2oz. to 4 gallons of spray. D.D.T. 50 per cent. wettable powder at $\frac{1}{2}$ oz. in 4 gallons of water may also be used for the pests.

Watercress

Watercress, a moisture-loving perennial, can be a valuable addition to the salad crops already grown in the average garden. Fortunately, it may be grown in places where there is no running water. Prepare ground and sow seed now in a part of the garden where the soil will not become dry and hard. Take out a trench approximately 2ft. wide and 1ft. deep and refill it with 6in. of rotted manure and tramp it firmly. On top of this add 3in. of good soil. Sow the seeds $\frac{1}{2}$ in. deep and preferably 12 to 18in. apart. Cuttings taken from stock beds may also be used. Copious water must be applied to give watercress some semblance of its natural aquatic conditions. Pickings will be available in about 6 weeks from sowing until spring.

Lettuce

For late-autumn and winter supplies of lettuce, seed may be sown during February. The secret of producing crisp, tender heads is quick growth, and this of course means a soil rich in available plant foods. When hearting is about to begin it is advisable to dress the soil with some quick-acting nitrogenous fertiliser. Nitrate of soda or sulphate of ammonia applied in liquid form (1oz. to 4 gallons of water) weekly will give this stimulus. Applications of liquid animal manure as a substitute would be beneficial. At this time of the year it may be more convenient to raise the plants in boxes and transplant them to raised beds than to sow seed directly into the garden.

Varieties recommended for February sowing are Imperial 615 and Neapolitan (Winter Market).

Beetroot

It is customary in most parts of New Zealand to make a final sowing of beetroot in January or February. February sowings usually produce fair crops in northern and central districts, but further south it is not advisable to make a final sowing later than January. Lime at 3 to 4oz. per square yard is usually necessary on acid soils not recently dressed. Ground which has been previously dressed with organic manure is preferable. Sow $\frac{1}{2}$ in. deep in rows 15in. apart and thin plants to 6in. apart.

Varieties: At this time of year Detroit Dark Red, Crimson Globe, and Obelisk are recommended.

Resistant Type of Rape for Areas Infected with Club Root

RAPE, a high-quality lamb-fattening feed, occupies an important place in the fat-lamb industry of the Dominion. Between 150,000 and 160,000 acres are grown annually, the greater amount of it in the arable-farming areas where pastures are renewed frequently and where fertility for grain production has to be restored. In this article W. R. Lobb, Instructor in Agriculture, Department of Agriculture, Oamaru, describes the success which has attended the introduction of a type of rape resistant to club root disease.

DISTRIBUTION of the rape crop throughout the South Island indicates in some measure the manner in which it is bound up with farming systems and climate. The crop is seldom grown where lambs can be fattened off their mothers or where specially saved topdressed pastures are available after weaning. More than 80,000 acres are grown in Canterbury, 33,000 acres in Otago, and 13,800 acres in Southland. In Otago by far the greatest areas are in the grain-growing districts of North and South Otago. In Waitaki County there are 12,000 acres, and Bruce, Clutha, and Tuapeka Counties altogether grow some 18,000 acres.

Varieties and Feeding Values

Three types of rape are available commercially in New Zealand at present—Giant, Broad Leaf Essex, and Club Root Resistant. Commercial rape seed at one time was very badly mixed and the name under which it was sold was not necessarily an indication of type. Now most rape seed is correctly named and the added assurance of certification is available, as all three types are produced in New Zealand under the certification scheme. Since this procedure was inaugurated the Broad Leaf Essex type has changed somewhat with the inclusion of a little Giant blood to give greater production without materially affecting its other qualities.

In general, the rape that matures or ripens best has the highest nutritional value. The dry matter of mature rape is about 20 per cent., of which 10 to 12 per cent. is crude protein. Immature rape may contain as little as 14 to 15 per cent. of dry matter, of which as much as 25 to 30 per cent. is crude protein. When rape is fed before maturity, or when it does not ripen because of continuous wet weather, it contains too high a percentage of protein; then digestive troubles resulting in scouring arise and the lambs will not fatten. Second-growth rape rarely ripens satisfactorily and frequently is held to have little value for fattening. Therefore when poor lambs are fed under wet conditions on immature rape it is advisable to feed good-quality lucerne, clover hay, or chaff



[Jack Welsh and Sons photo.]
Rape of Club Root Resistant (left) and Broad Leaf Essex (right) types after the second grazing.

in addition. A light seeding of mustard is often included with rape, mustard being considered to have a dietetic value in preventing scouring.

Under similar conditions Broad Leaf Essex is considered a better-ripening rape than Giant or Club Root Resistant, both of which are about equal in this respect. Under very dry conditions the Giant types ripen satisfactorily and frequently outyield the Essex type. Under the cold, wet conditions often experienced in the south the Essex type frequently ripens no better than the Giant types. The tall growth habit of the Giant types makes them less attractive for feeding in high-rainfall areas, because under such conditions the lambs are feeding with wet backs all the time.

Grazing Management

The sowing of the rape crop is generally timed to fit in with the weaning date of the lambs. Rape normally ripens in 12 to 14 weeks, but under conditions of good rainfall and high fertility it may take longer. The feeding of a rape crop may extend over a long period, but a normal period would be 4 to 6 weeks. To extend this short feed period rape is usually sown at suitably spaced intervals, sometimes as many as four sowings being made at 2-weekly intervals.

When grazing is begun the crops should be temporarily fenced into breaks of such a size that each can be eaten out in about 2 weeks. Lambs may be fed on rape without a run-off, but a run-off on to stubble or a hay aftermath is good. Access to permanent pasture, possibly heavily infested with worms, should not be permitted, and allowing the lambs to run back

over the previously grazed breaks is equally undesirable. Ewes, mature dry sheep, and cattle are used to clean up breaks which lambs could not finish in the time desired. Second-growth rape is frequently used for these classes of stock, though on occasions lambs will thrive quite satisfactorily on it.

Diseases and Insect Pests

Damage to rape by the adult beetle of the grass-grub is sometimes serious. By avoiding sowing in late November or early December the damage can sometimes be reduced.

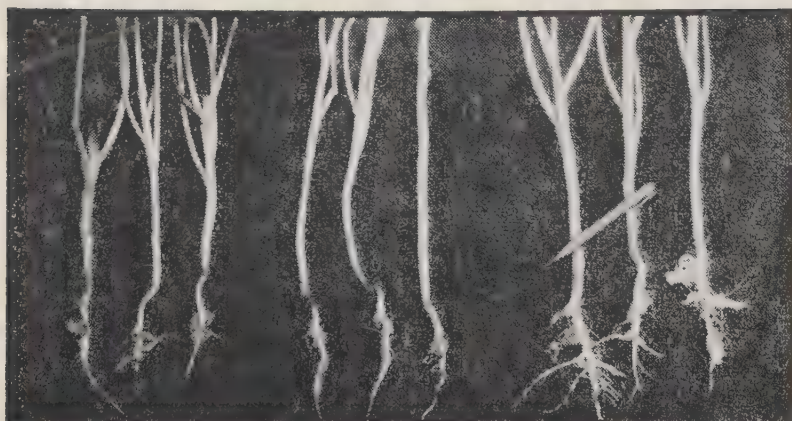
The diamond-backed moth may attack rape and reduce its yield considerably, and aphides, if really bad, can ruin a crop. Both these pests attack rape toward its ripening stage, and if the attack appears likely to destroy the crop, the remedy is to graze the crop at once. This type of damage is usually confined to dry districts in dry seasons when the crops are not doing particularly well.

Club root will readily attack rape of the Broad Leaf Essex or Giant types in soils and in districts where this disease is prevalent.

Trials with Club Root Resistant

Seed of Club Root Resistant Rape, which is the latest addition to the list of fodder crops, is now being marketed in New Zealand after many years of research. The introduction of this type is likely to make rape growing of considerable importance in some southern areas where the susceptibility of the crop to club root was one of the major causes of its loss of popularity. It could reintroduce the growing of rape after turnips or swedes, a

CLUB ROOT RESISTANT RAPE



Rape plants of three types. Left—Broad Leaf Essex. Middle—Club Root Resistant. Right—Giant. The roots of the Resistant plant are free from club root nodules.

rotation which finds favour in many districts. Whenever club root occurs as a disease of the rape crop this new strain can be recommended confidently as providing an assurance against loss.

The work on Club Root Resistant rape was begun by J. G. Gibbs at the Department of Scientific and Industrial Research Plant Research Station, Palmerston North. The original seed introduced from France showed some promise, and selection work was carried on at the Agronomy Division of the Department of Scientific and Industrial Research at Lincoln by the late R. A. Calder, who took over the seed on the departure of Dr. Gibbs to the Falkland Islands. The possibilities of the variety were noticed when small supplies of seed were sown out in trials in the club root infected areas in Southland. These trials were instituted by the Department of Agriculture, and early results of the trials of the variety in Southland resulted in a more intensive programme of trials being undertaken. During the 1947-48 season these trials reached paddock size over extensive areas and results were promising. Altogether 38 observational trials were laid down in Otago and Southland districts—9 in Balclutha, 2 in Dunedin, 25 in Gore, and 2 in Invercargill.

The Resistant type is not claimed to be immune to club root, but in these trials it has shown a high degree of resistance to it, and thus has promise of re-introducing the rape crop into areas in which club root attack caused its abandonment.

In these early trials 30 growers stated that they were satisfied with the new strain, and at least 8 requested more seed for the next season. Thirteen stated that sheep showed preference for the Club Root Resistant rape and only one or two stated that Broad Leaf Essex was eaten first.

In the following two seasons the behaviour of crops from commercial sowings was watched, and good crops were obtained, even after a club-rooted crop had been grown on the same ground the year before. Where a whole crop of Broad Leaf Essex

has been infected and Giant very badly attacked, the Resistant strain has shown no effect from club root infection. However, the amount of club root infection in the initial crop has a direct bearing on the second-growth recovery. A crop with an initial infection of club root will give no recovery after grazing, and this factor is in favour of the Resistant type. The resistance of this new strain to attack has become so well established that growers quite confidently follow club-rooted swede crops with rape, with very satisfactory results.

BOOK REVIEWS

"Floriculture": Alex Laurie and Victor H. Ries

FOR the student or the gardener who desires to know the general principles of horticulture "Floriculture" is a valuable book. The authors, Alex Laurie and Victor H. Ries, are professors of floriculture at the Ohio State University.

The book's 500 pages do not give detailed information about any specific aspect of floriculture, though that is something which can hardly be expected in a book of this nature. It contains up-to-date information about new methods and practices which may be successful and practicable under New Zealand conditions. A brief outline is given of plant taxonomy, soil-less culture, landscape gardening, and propagation of plants, and a very wide range of types of plants is discussed, with useful notes on cultivation, pests and diseases, pruning, and planting.

This book is not written for the professional rose or carnation grower or for the advanced student in horticulture, but for those who want to know more about the general principles of floriculture it will prove valuable.

—R.O.

McGraw-Hill Book Company, New York.

In the 38 trials referred to 24 were recorded as free from disease, 8 showed a negligible trace, and 3 showed a measurable percentage of disease. The amount of disease in 3 crops was not stated.

With a limited area under cultivation and having to provide for very heavy stocking, many southern farmers place great reliance on the rape crop. On its success or failure depends the year's returns from fat lambs, and for this reason a strain resistant to club root is of great importance.

Merchants and farmers alike should realise that this rape was selected for only one purpose—for growing by farmers where losses caused by club root made the growing of rape risky or impossible. Undoubtedly it has fulfilled that purpose. Limited supplies of seed have been available, and in order that the best possible use may be made of the supply only farmers to whom club root is a problem should use this type of rape. Last season some of the seed was sown in areas where club root does not occur, thus denying others the use of this type. At the moment no recommendation is made that this type should displace Broad Leaf Essex or Giant where either of these two can be grown free from club root.

The success of Club Root Resistant rape is sufficiently well established for its use to be recommended on club root-infected land. The Department of Agriculture is producing Certified seed of this type, and in their own interests growers on whose farms club root is a problem should ensure that they obtain Certified seed.

"Swine Production": W. E. Carroll and J. L. Krider. McGraw-Hill Book Company, New York.

The approach in this book is one of practical farm economics, and although the whole situation in the U.S.A. is widely different from that applying in New Zealand, the method of approach is one which could well be applied to the industry in this country. This book is more suitable to the student of pig production than to the practical farmer in New Zealand.

"Insignis Pine": J. S. Reid. New Zealand Forest Service. 1s.

The use of exotic timber for building is increasing in New Zealand, and this booklet describes the suitability of insignis pine as a building timber. Useful information to farmers is given about the characteristics of the timber and the techniques of handling and treating it.

"Beekeeping: Craft and Hobby": A. R. Cumming and Margaret Logan. Macmillan & Co. Ltd., London. 10s. 6d.

This is an account of beekeeping on a small scale in Britain as practised by town dwellers and country folk owning up to 40 hives either as a hobby or part-time industry. Theory and practice are well covered, but considerable adaptation to New Zealand conditions would be necessary if the book were to be used as a guide by local beekeepers.

Systems of Pig Feeding and Management in New Zealand

Buttermilk Piggeries

IN this article, the third of a series on the principal systems of pig feeding and management in New Zealand, I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, deals with pig production on buttermilk.

WHEN the first dairy factories were established in New Zealand pigs were used to consume the dairy by-products from these factories and convert them into a marketable product. In fact nearly all the early dairy companies, both co-operative and privately owned, made pig production part of their activities. In some cases they operated bacon-curing plants as well as dairy factories, curing not only pigs produced by the company, but those of farmers supplying the factory.

The Edendale factory in Southland, which was established in 1882, and is generally considered to have been the second dairy factory to be built in New Zealand (the first being the Otago Peninsula Co-operative Cheese Factory Company Ltd. at Highcliff), shows in its records of that time: "One hundred and fifty Berkshire pigs are kept not far from the factory, to consume the whey". In the same year, 1882, the Te Awamutu Cheese and Bacon Company, the first dairy factory to be built in the North Island, started operations and commenced with 37 pigs.

In the early days all dairy factories were making cheese and it was not till some years later that butter manufacture became established. The

farmer took the whole-milk to the factory for the manufacture of both cheese and butter and in most cases took back to the farm whey or skimmed milk to feed to stock, calves, and pigs, although some factories, as has already been stated, kept pigs near the factory to consume the by-products.

Because cream is easier to transport than milk, it became possible

when home separation was introduced for dairy factories to draw supplies from a much wider area. This led to the establishment of much larger dairy factories, and the use of buttermilk from the factories for pig production on a large scale became general.

Methods of Using Buttermilk

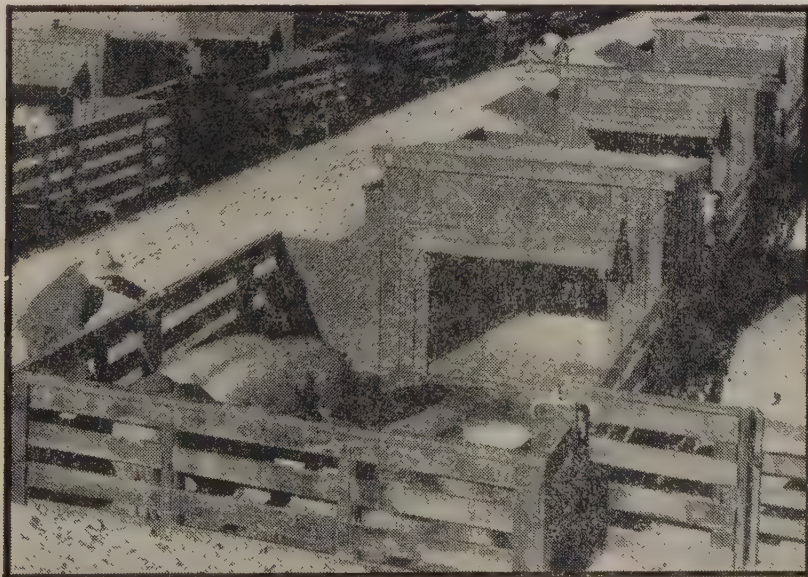
Two methods of using buttermilk became established: In one the buttermilk was sold to contractors at a fixed price per ton of butter manufactured; in the other the dairy companies established pig farms and produced the pigs. There are variations of these two systems. In some cases dairy companies have established pig farms and then leased them to an individual and in others a number of the shareholding suppliers of the company have agreed as a group to purchase the buttermilk from the company and then divide it among themselves. At present there has been a considerable decrease in the number of buttermilk piggeries being operated, owing to dairy companies installing plant to produce dried buttermilk, there being considerable market for this product at the moment. Whether this market will remain favourable remains to be seen.

Composition

In theory the manufacture of 1 ton of butter should produce 200 gallons of buttermilk, but in practice the yield is nearly 300 gallons per ton of butter, owing to the addition of water during the manufacturing process. It is this additional water that makes the food value of buttermilk lower than that of skimmed milk, which it otherwise closely resembles in composition.



[Department of Internal Affairs photo.]



[National Publicity Studios photo.]

The breeding of pigs on buttermilk requires adequate and well-designed farrowing accommodation.

MANAGEMENT OF BUTTERMILK PIGGERIES



A system of pipes and taps is used to convey buttermilk to the troughs.

If buttermilk is used as the only source of fattening food for pigs between weaning and bacon weight, it takes about 700 gallons to produce 100lb. of dressed pig meat; only 500 gallons of skimmed milk are required to produce the same amount of pig meat over the same period. The buttermilk from 1 ton of butter should produce approximately 40 to 50lb. of pig meat. This is a useful guide to its gross cash value in fattening pigs.

Variation in Price

The price paid by farmers who purchase buttermilk on contract varies very considerably. One of the factors that has a large influence is the method by which the buttermilk is transported to the farm from the factory. In some cases it is carted by tanks on motor trucks; owing to its bulk this is extremely costly and is generally used only in the case of factories whose output is small. Wherever it is possible, and generally in the case of the larger factories, buttermilk is pumped from the factory to the farm. Under the pumping system there is still a considerable variation in the price paid, due to whether the factory or the farmer is responsible for pumping costs and the maintenance of the pipeline; in some cases the costs are shared.

The initial cost and maintenance of pipelines from the factory to the farm represent a considerable item. Galvanised piping, which is generally used has a comparatively short life when used for this purpose owing to the action of the buttermilk on it and to the high pressures that have to be used. Where the line is fairly long or there is a considerable lift pressures of 150lb. to the square inch are not unusual. Specially manufactured wooden pipes are very satisfactory and, although these are more costly than galvanised pipes in the first place, they appear to last almost indefinitely. At least one dairy company has

installed wooden pipes and they are proving very satisfactory.

The price paid for buttermilk is usually based on per 100 tons of butter manufactured and varies from £10 to £20 for this. The gross cash value of pig meat per ton of butter is arrived at by taking the production figure of 40 to 50lb. per ton of butter manufactured at the ruling scheduled price. From this all costs of production must be deducted and these vary considerably with the individual circumstances.

High Capital Outlay

The capital cost involved in large-scale pig production on buttermilk is considerable. Owing to the large number of pigs that have to be handled, housing must be designed to reduce the labour of feeding, cleaning, and general management to the lowest possible point. As a result, the fattening house in some form or other is used. Usually housing is designed on the unit principle, each unit holding 10 to 12 baconers. The design of the units is the same as those used on dairy farms, the number of units per house being very much larger. As milk is the major food employed, it is usual to have a system of pipes from a central tank, into which the buttermilk is pumped from the factory, to all houses and troughs, at which it is controlled by taps.

Drainage must be efficient and adequate, and because of the large number of pigs kept and the consequent amount of waste that has to be dealt with, it constitutes a much greater problem than on dairy farms. A really good water supply is also essential and it must be laid on to all houses in order that cleaning may be as easy as possible.

Supply of Pigs

The supply of pigs on a large-scale commercial farm using buttermilk is a problem. Buttermilk as a food for

pigs is not easy to handle, and breeding sows and young suckling pigs do not do as well on it as on skimmed milk or whey. For these reasons breeding of pigs on buttermilk is not easy and is not made any more so by the high stocking rate which large-scale breeding of pigs entails. As a result it is more usual to purchase store pigs for fattening than to breed them. A policy of breeding some of the pigs required and purchasing the rest is followed in a number of cases. As the supply of food on these farms is frequently obtained very cheaply, it is possible to pay a higher price for store pigs than can the ordinary dairy farmer. In fact, owing to the large scale of operations on the commercial unit, good profits can be made even when pigs are purchased at a higher price per pound than that at which they are finally sold when fat. One consequence of this is that pigs on the buttermilk farm are usually taken up to top weight before being sold, with the unfortunate result that they are much too fat.

In some cases it has been possible for the buttermilk feeders to arrange long-standing contracts with neighbouring dairy farmers to breed pigs for them and carry them to store weights. This is much more satisfactory than buying the pigs in the saleyards.

In several instances both co-operative dairy companies operating buttermilk piggeries and private contractors have been successful in breeding pigs on buttermilk on a large scale and have established pedigree herds of all breeds in use in the Dominion that have become a valuable source of breeding stock for dairy farmers and other pig producers. In this the personal factor in management is of the greatest importance. Far more skill and experience are necessary to handle 100 breeding sows successfully than half a dozen.

Home-grown Crops

Where sufficient land is available it is customary to winter a large number of pigs on home-grown crops. This enables the operator to buy pigs in autumn, when prices are favourable, instead of being forced to do so in spring. The type of crop grown varies with the type of land and the climate. In districts where it is possible to grow a grain crop such as maize or barley as well as roots the wintering problem is much simpler. Where cereals cannot be grown some meal must be purchased.

Some buttermilk producers are fortunate in being able to obtain waste from food factories or town garbage to supplement the buttermilk, and this is of great assistance, especially in feeding the pigs during winter.

The efficient utilisation of buttermilk in pig production requires skilful and experienced management, adequate capital expenditure in the form of buildings and plant located on a sufficiently large area, and a sufficiently long-term contract (in the case of the private contractor) to attract the capital investment necessary. Under these conditions pig production on buttermilk can be highly profitable.



Control of Buttercup and Pennyroyal on Hauraki Plains

By G. L. BANFIELD, Instructor in Agriculture, Department of Agriculture, Thames.

UNTIL two seasons ago there was no satisfactory economic method of eradicating the perennial weed pennyroyal from pastures, nor was there any satisfactory method of controlling buttercup on pastures grazed by cattle. The advent of hormone weedkillers and the invention of the low-volume spray nozzle have now made it possible to eliminate both of these weeds with a single treatment at a cost for materials of from 7s. 6d. to 15s. per acre.

WHEN New Zealand was colonised the Hauraki Plains, lying to the south of the Firth of Thames and bounded by the Coromandel Range on the east and hills on the west, were a wet swamp through which meandered the Waihou, Piako, and Waitakaruru Rivers. A major part of this area consists of heavy alluvial soils lying to the east and north, but most of the western and central areas consist of peat. The former were clothed with flax, raupo, and kahikatea trees while rushes dominated the peat. The area has been drained by large canals and drains and some land has been reclaimed from the sea by stopbanks. Stopbanks also run alongside the rivers, preventing their overflow in flood periods on to the farming land. All of the alluvial land and much of the peat have been reclaimed from the swamp vegetation and are in pasture. In spite of the drainage system much of the land lies wet in winter. It is devoted almost entirely to dairying, but some cattle for fattening and sheep are run. In winter much of the land becomes poached by cattle. This poaching can be reduced by keeping stock off in winter and replacing them by sheep. On dairy farms the cows are wintered while dry, to a large extent in hill properties, but since they come into profit in July and August, the wettest months of the year, considerable poaching cannot be avoided.

Causes of Weed Invasion

Because of the poaching, the pastures become open and infested

with weeds, mainly buttercup, pennyroyal, scotch thistle, and docks. These are all weeds of high-fertility conditions, for the soils farmed are of high fertility. Consequently the Hauraki Plains have become notorious for the weediness of the pastures. Dairy farms are yellow in spring with buttercups and purple in summer with pennyroyal. The grasses and clovers are suppressed and when the pennyroyal dies down in autumn the land is left bare and open.

If dry conditions occur in late summer and autumn, the bare ground cracks, crickets become plentiful, and the grass and clover do not recover. Consequently the bare spaces become clothed with weeds. With wet autumns the pastures recover and the weed invasion is not so great.

Poaching of the land in winter, perhaps the primary cause of weed invasion, can be overcome only by intensive drainage. On the stiff, marine clay soils which cover much of the Hauraki Plains thorough drainage with fascines and tiles has not been practised. Surface drains have been widely used to prevent poaching and these are constructed with a grader so that there is an even slope from the crest to the depression. Where this is not done rolling to iron out the poached paddocks reunites the turf, providing a better cover of grass and clover in which the weed seedlings have a less favourable start.

It can be seen that weed invasion of the pastures on the Hauraki Plains can be associated with wet winters

and dry summers and autumns. Wet winters cause poaching and dry summers and autumns lead to bare ground, cracking, and cricket invasion, and provide a good medium for weed seed germination and establishment. The feeding of silage during dry summers helps to avoid over-grazing of pastures during the dry period and helps to maintain a sole of grass and consequently there is less opportunity for buttercup infestation. The use of penetrating grass harrows at this time should be avoided, since the harrows simply improve the seed-bed for the establishment of weeds from seeds that may lie in their millions on the ground surface. Similarly the leveller, an implement used extensively on the Hauraki Plains for planing off high places of poached paddocks, competes with the harrows in its ability to provide a good seed-bed for weed seeds. If these implements are used, their application should at least be followed by the sowing of ryegrass and clover seed to compete with the weeds.

It will be noted that the causes of weed invasion are to a fair extent outside the control of the farmer or are difficult for him to combat. Consequently much attention has been paid to measures that remove the weeds, but though some of these measures have been very successful in destroying buttercup and pennyroyal, they do not remove the underlying causes. If these were removed, chances of weed invasion would be lessened and still greater production would be achieved than if the weeds only were destroyed.

Control by Mower

Repeated mowings will not prevent a proportion of the lower flowers from setting seed. The use of the mower will, however, ensure that the pasture is not smothered out. The buttercup is reduced to a level where the grasses

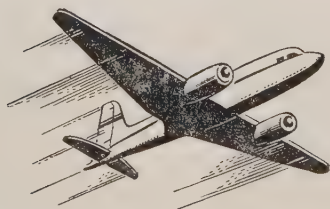
HEADING PHOTOGRAPH: Spectacular results achieved by spraying against buttercup. The intensity of cover of buttercup in some districts is shown.



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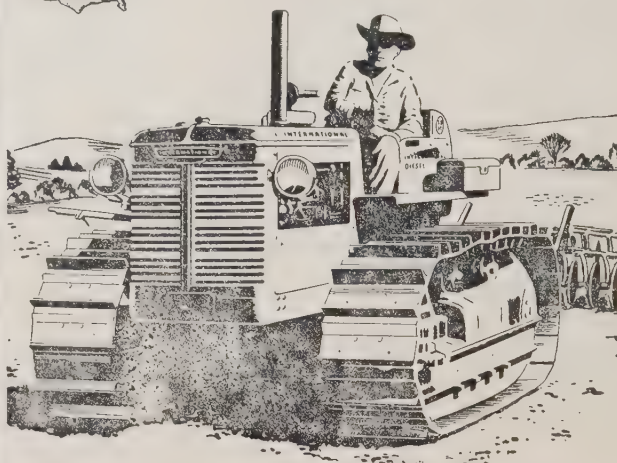
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and clovers have a fighting chance of competing with the buttercup for survival.

On farms where mowing has been carried out systematically a better cover of pasture has been maintained, with the result that the liability of severe reinfestation in autumn has been largely reduced.

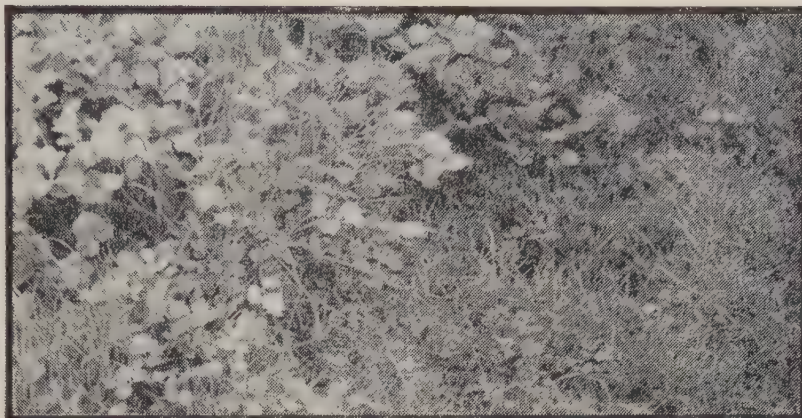
Control by Sheep

It is, of course, common knowledge that grazing sheep will control buttercup. However, it is not suggested that farmers change their mode of farming from dairying to sheep entirely, even if holdings were large enough to permit this.

A number of farmers on the Hauraki Plains have been induced to buy wether sheep in autumn and carry these through winter and spring. These have been farmers who do not winter their dairy herd on the home farm but employ a run-off.

The results have been: 1. Pastures instead of getting away to rank growth all over the farm, in the absence of the dairy herd, have been kept under control by the sheep. 2. The sheep in direct contrast to the cattle beast has had a levelling effect on the poached paddocks. Because the sward is maintained intact, seeds of such weeds as buttercup and pennyroyal do not get the same opportunity to establish during spring. 3. The autumn-germinated buttercup is controlled by the sheep at such a level that the pasture species can compete successfully with the weed, instead of being almost smothered out. 4. A profit can be made from the sale of the wethers when they are no longer required for weed control, and in this respect Hauraki Plains farmers have been successful in clearing £1 per head over the last two seasons.

CONTROL OF BUTTERCUP



Pasture treated for buttercup (right) and untreated (left).

When the cows are brought back on to the home farm in spring the sheep are used to clean up each paddock immediately behind the rotationally grazed dairy herd. This necessitates a fairly large number of sheep (about 50 per acre) to clean up the buttercup growth within a reasonable time. Smaller numbers have been quite ineffective.

The use of the sheep has not decreased the butterfat output from these farms, but has brought about a very rapid improvement in the pastures and as already stated the sheep have themselves produced a handsome profit.

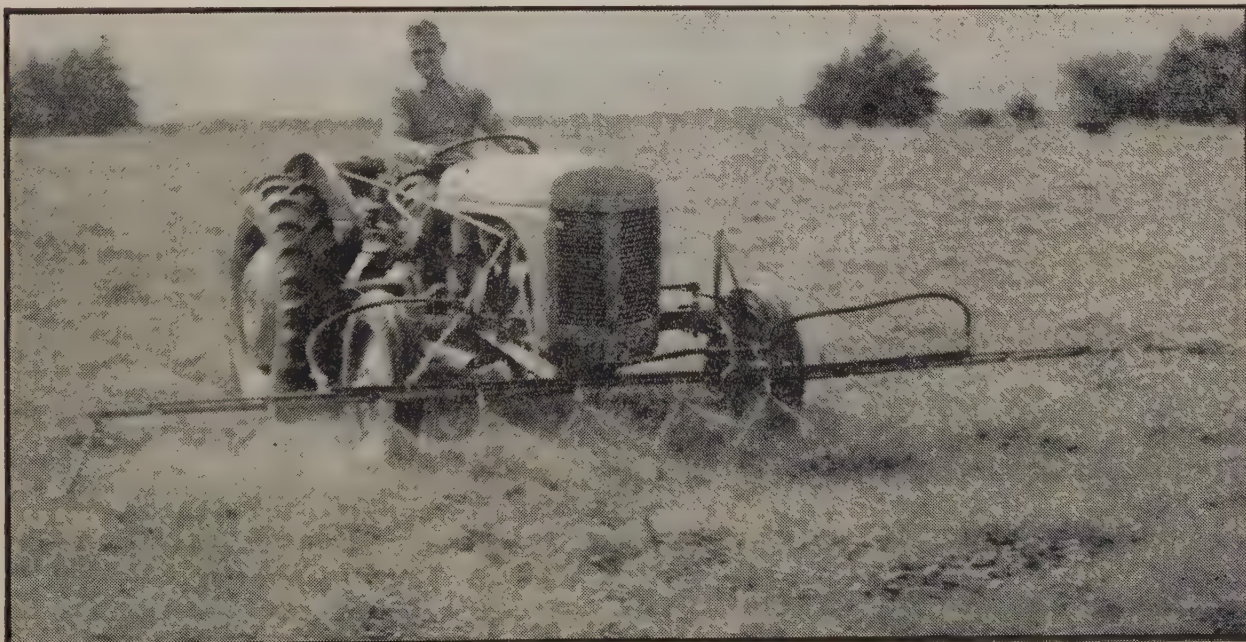
The chief objection to the use of sheep is of course the necessity of providing suitable fences.

Hormone Weedicides

Control by the use of hormone weedicides is now well accepted on the Hauraki Plains, where about 2000 acres of pasture was sprayed last spring for the control of buttercup and pennyroyal. Twenty to 30 privately owned low-volume spray plants as well as three contractor outfits were in operation during that period.

Trials with Sprays

Rates per acre of the hormone weed-killers will be given in pounds of acid (2, 4-D or M.C.P.) equivalent. This is necessary owing to the variety of strengths in which the weedicides are sold.



A contractor spraying buttercup on the Hauraki Plains with a low-volume outfit.

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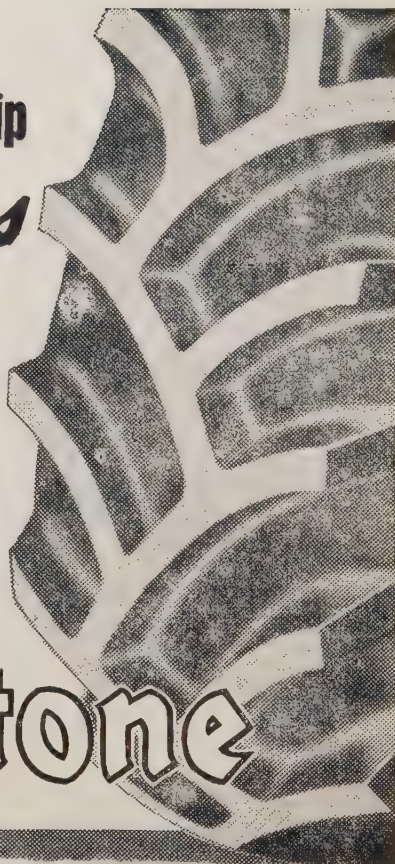
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CONTROL OF BUTTERCUP

Trials have shown that 1lb. of 2, 4-D acid equivalent per acre as a spray is sufficient to produce a satisfactory control of buttercup, and in trials carried out a 99 per cent. kill was obtained at this rate. Although a 100 per cent. kill can be obtained by the application of 1lb. of 2, 4-D per acre, the extra cost involved in obtaining such a kill does not appear to be warranted. Pennyroyal is apparently a little tougher than buttercup and trials have demonstrated that 1lb. of 2, 4-D per acre as a spray is necessary to bring about a complete kill.

Where both buttercup and pennyroyal occur as weeds in the same pasture it is of course necessary to spray at the higher application rate of 1lb. of 2, 4-D per acre to ensure control of both weeds.

Two types of control material are in general use on the Hauraki plains:—

1. Ethyl ester of 2, 4-D (oil based). This is represented commercially by "Weedone Concentrate 57".
2. Sodium salt of 2, 4-D (water soluble). This is represented commercially by "Frenokone", "Phenoxone", "Stantox Powder", and "Ataweed Powder".

Both of these materials are being used with complete success for the control of buttercup and pennyroyal, and trials have failed to prove one more satisfactory than the other in this respect.

Several other forms of hormone weedkillers have been shown to control buttercup and pennyroyal successfully. Water-based materials (for example, the sodium or amine salt) have certain advantages over oil-based materials in that damage to clovers is likely to be less severe with the water-based hormone weedkillers. On the other hand the oil-based materials are generally more effective per unit of active hormone ingredient and may be applied at lower rates per acre and still give effective weed control.

The oil-based material also has the advantage that it keeps the spray plant in good order. Because of its volatility it will ensure a 100 per cent. coverage in spite of a miss in coverage or a blocked nozzle.

This latter advantage may, however, become a disadvantage when it is desired to operate close to a susceptible crop. But it is also claimed that the oil-based hormones are more satisfactory than water-based hormones for application during wet weather because of their greater sticking power.

The water-based material has the advantage that it is slightly more selective in action. Crop plants and clover may be damaged by the oil-based hormones when water-based sprays may not cause such damage.

Some farmers have experienced difficulty in dissolving the sodium salt. Trying to dissolve the powder in insufficient water has been the cause of the trouble. Three pounds of the sodium salt will dissolve in 100lb. or 10 gallons of water; 1lb. of the salt requires therefore at least 3 1/3 gallons of water for complete solution. In practice the salt can be shovelled directly into the tractor-mounted tank and the requisite quantity of water added. Complete solution is obtained



Buttercup 7 to 14 days after spraying. Note the open nature of the sward resulting from the smothering effects of the weed. Where spraying is carried out early the pasture has a chance to close up before the onset of dry weather.

in 2 minutes. Where the water-based chemical is employed greater care must be taken of the spray plant to avoid corrosion.

Trials have also been carried out with M.C.P. acid, represented commercially by "Agroxone". This material was compared as a spray with the sodium salt and the ethyl ester at a rate equivalent to 1lb. of 2, 4-D acid per acre. All three produced a 100 per cent. kill of buttercup at the given rate.

In a similar trial on pennyroyal the M.C.P. acid was markedly inferior to the other two materials, which each produced a complete kill.

Trials with Dusts

In trials with dusts carried out on buttercup the sodium salt produced a complete kill when applied at a rate equivalent to 1lb. of 2, 4-D per acre with sufficient lime to enable the application to be made with a topdresser.

M.C.P. acid applied in a similar manner required 4lb. of the active ingredient per acre to produce a similar result. It is understood, however, that in a trial carried out in the Dargaville district 1lb. of M.C.P. acid produced a fairly satisfactory kill of buttercup and that in the Warkworth district this material has given good results.

Where topdressing is normally carried out and where a spray plant is not available the mixing of the requisite amount of the sodium salt with the lime or fertiliser provides a very satisfactory method of dealing with buttercup. Thorough mixing of the weedicide with the topdressing material is of course necessary.

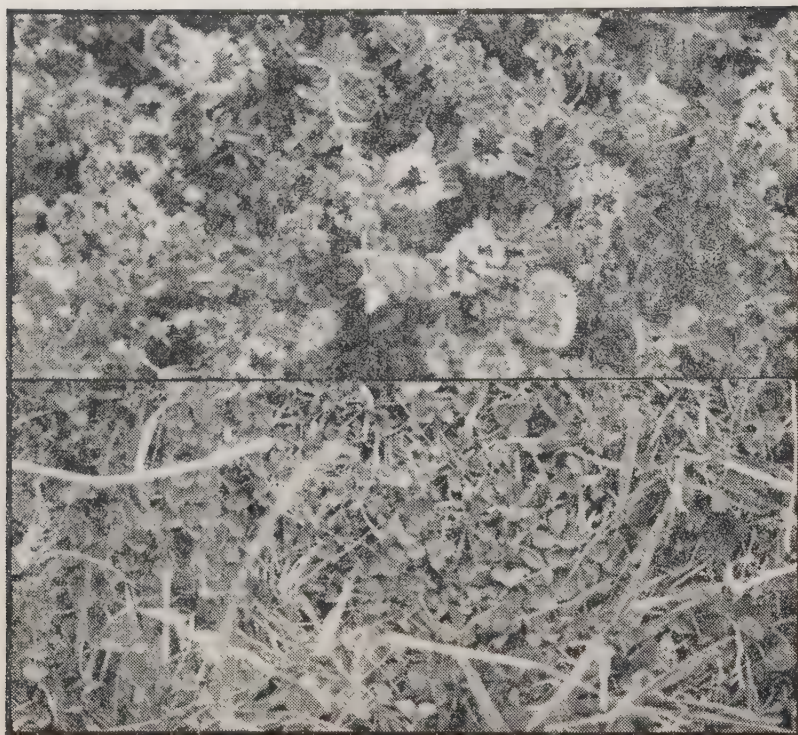
Time of Application

Best results have been obtained by spraying during September, October, and early November. Buttercup has a detrimental effect on pasture owing to its smothering action on grass and clover alike. Its eradication may leave bare patches 18in. to 2ft. in diameter if it is sprayed at an advanced stage. For this reason spraying should be carried out earlier. There is no point in spraying buttercup once it has reached full maturity, as soon after it has reached this stage it dies out naturally.

As already stated a large proportion of the buttercup seed germinates in autumn following autumn rains. It was thought therefore that spraying in late autumn or early winter while the ground was still firm might result in the eradication of the weed before it had a chance to damage the pastures by its smothering action.

A trial was laid down last June to test this theory. Although a satisfactory kill of the buttercup was obtained, the action of the hormone was very slow indeed and at one stage it was fully expected that the buttercup would recover completely. The slow rate of kill at this time of the year is now well explained by some recent work carried out overseas, which has shown that movement of hormones in the plant is associated with the translocation of the products of photosynthesis. Carbohydrates are built up in the leaves of plants from carbon dioxide extracted from the air combined with water. This function is performed in sunlight by the green pigment (chlorophyll) in the leaves; the process is called photosynthesis.

CONTROL OF PENNYROYAL



Treatment of pennyroyal. Upper—Control. Lower—After spraying with hormone weedkillers.

Carbohydrates thus synthesised are then translocated mainly to the roots where they are stored.

During winter under reduced sunlight the manufacture of carbohydrates is at a low level, resulting in little translocation.

During spring, however, when growth is at its maximum there is a rapid building up and transfer of carbohydrates. Since the movement of hormones in the plant is associated with this movement of carbohydrates, it follows that the action of the hormone will be much more rapid during the actively growing period than during winter.

As plants reach maturity there is once more a slowing down in the rate of manufacture and translocation of carbohydrates and this explains why the pennyroyal and many other plants tend to become resistant to the weed-icide at this stage.

Although buttercup is a weed of spring and pennyroyal a weed of summer, both weeds can be eliminated by one application; by spraying to kill buttercup the pennyroyal is also killed.

If spraying is carried out much later than November, the buttercup has already done its damage, pennyroyal becomes more resistant, and the white clover is more liable to damage.

On the Hauraki Plains during the first season of hormone spraying attempts were made to kill pennyroyal by spraying after Christmas employing increased amounts of 2, 4-D.

These attempts were mainly unsuccessful, depending upon the stage of maturity of the weed. The white clover at this stage, however, appears to be very much more susceptible than during spring, and in many cases it was completely eliminated by these later sprayings.

By spraying at the correct time in spring it is possible to eliminate spring-germinated weeds as well as autumn-germinated weeds. Such incidental weeds as scotch thistle are of course also completely eradicated. Docks, however, are resistant and mature docks quickly recover.

Results of Spraying

No trials have been carried out to determine how pasture production has been increased as a result of spraying the buttercup and pennyroyal. However, the results obtained by one farmer are of interest. This farmer has had a total of 70 acres of his 80-acre farm sprayed by contract over the last two seasons at a cost of £120. His butterfat production for the 1947-48 season was 10,899lb. His production for the 1949-50 season was 13,494lb., an increase of over 2500lb. The increased revenue has more than covered the expense of spraying, and the improvement to his pastures is beyond question.

It is common for farmers on the Hauraki Plains to experience a drop in production about the time when the buttercup reaches its maximum growth. It is significant therefore that two farmers who sprayed the greater

proportions of their farms last spring did not experience the usual drop.

There is no doubt that on a number of farms which have been badly infested with buttercup and pennyroyal a phenomenal improvement in the pasture has resulted from judicious spraying. Where treatment has been carried out during spring in the period of active growing, pastures have closed up rapidly. This is not the case where buttercup has been allowed to run its full course, since by this time the flush growth period is over and pastures tend to remain open through summer providing further opportunity for re-establishment of buttercup seedlings in autumn.

The use of the sprays will not prevent the germination of the weed seeds of which there may be sufficient in the ground to provide successive crops for many years to come.

The degree of re-infestation at later periods will depend on the management of the pasture after spraying. If the conditions responsible for the original infestation are re-created, further trouble must be expected.

On a number of farms where treatment for buttercup was carried out during spring, 1948, it was possible in the spring of 1949, to differentiate the treated from the untreated areas. This was so only where management after treatment with the hormones was favourable.

Where pennyroyal has been sprayed, regrowth in subsequent seasons has been negligible, which is extremely satisfactory. Until the advent of the hormone weedicides there had been no satisfactory method of dealing with what may be regarded as one of the worst perennial weeds of pastures on the Hauraki Plains.

Considerable use has been made by some farmers of spray treatment on paddocks required to be closed for hay. This has enabled good-quality hay to be made where formerly the conservation of such pasture was not even contemplated.

Although the main purpose of the spraying may be to control buttercup or pennyroyal such incidental weeds as scotch thistle, catsear, and other flat weeds are also eliminated by the treatment.

Summary

Where buttercup reaches the density of that to be found on the Hauraki Plains the use of chemical weedkillers is definitely warranted to obtain clean pastures where normal farming methods have failed.

Spraying for buttercup control is likely to be an annual event unless steps can be taken to eliminate the cause of invasion of the pastures by the weed.

The time has come when pennyroyal can be crossed off the list of serious pasture weeds. Its elimination can be brought about at a cost considerably below that of topdressing, while the benefits to be derived from its eradication are likely to be very much greater.



TOPDRESSING DEMONSTRATION BY HEAVY AIRCRAFT IN WALES

The success of aerial topdressing of hill country from light aircraft as a commercial venture in New Zealand, and the results of experiments with a heavier machine carrying about a ton (reported in the "Journal" for April, 1950), have led to more far-reaching experiments in Britain. British farmers have become accustomed to helicopters being used for weed and insect control and other farm operations calling for only small loads, but in recent months a demonstration of topdressing was given over Welsh hill country by an aircraft carrying 6 tons of fertiliser. The prospect was opened up of returning to the land, as no other method could, the lime and phosphates which for centuries have been leaving the hills in the bone and tissue of cattle and sheep. The aircraft used was a Freighter, which the Bristol Aeroplane Company, interested by the results of the New Zealand experiments, converted for the work by installing in it three 2-ton hoppers. Because the venture was experimental and the aircraft was operating from an airfield 85 miles away, the economics of it could not be computed accurately, but the company assessed the cost of distributing 2cwt. of phosphate per acre at 7s. 6d. per acre or £3 15s. per ton. The photographs show: 1 and 2—The most spectacular drop, in which 5 tons of lime were distributed at 15cwt. per acre. 3—The trunk of a loading hopper being inserted in one of the inlets leading to the discharge hoppers in the fuselage of the aircraft. 4—A portable radio-telephone unit being used for ground-to-air control. 5—A Welsh farmer stooping to examine thickly strewn lime. 6—The aircraft being refuelled and reloaded between flights. 7—The 5-ton load of lime starting to fall from the nine vents in the bottom of the fuselage. 8—The three inlets in the wing and the cabin fairing through which the fertiliser is loaded.

Production of Good-quality Honey

Seasonal Notes for the Domestic Beekeeper

MANY new beekeepers each year find difficulty in harvesting their honey crops without undue disturbance of the bees and also have trouble in keeping their honey in good condition for domestic use for long periods. This article contributed by the Horticulture Division describes how honey is produced and conditions necessary to get honey of good keeping quality.

HONEY is the nectar and saccharine floral exudation of plants, gathered, modified, and stored in the comb by bees. Secretion of nectar is a remarkable function of plant life. It consists, primarily, of the production of a sugar solution from special organs of the plant known as nectaries, located in various parts of the flower. Nectar secretion has been considered by many naturalists to be a means of attracting insects to plants to ensure proper dissemination of pollen and cross-fertilisation of the flower.

In whatever form the beekeeper desires to market honey or secure sufficient from a few hives for his own use the bees must first store the honey in a comb entirely of their own making or in a comb built by them on a wax-base comb foundation supplied by the beekeeper.

Search for Nectar

The older bees in a hive perform the task of flying to the fields, searching out nectar-bearing flowers, and bringing load after load of diluted nectar back to the hive.

The field bees visit the flowers and remove the nectar with their tongues and mouth parts, the individual bee usually visiting the same kind of flowers on each trip until it has accumulated a small drop about twice as large as a pinhead. Nectar is swallowed into the honey stomach in the worker bee's abdomen. When the field bee arrives at the hive it regurgitates the nectar from the honey stomach through the mouth parts, yielding the load to a younger hive bee for ripening and storage.

Removal of Excess Moisture

Fresh nectar from the flowers is a complex product containing 30 to 70 per cent. moisture, sugars, minerals, proteins, and other substances. The process of ripening to convert the watery nectar into thick honey includes the removal of excess moisture, which is reduced to between 17 and 18 per cent. in honey.

The young bees exude the nectar between their mouth parts to some extent. Excess moisture is also removed by the bees fanning with their wings to circulate currents of warm air through the hive. During the honey season, when there is a heavy flow of nectar, this work goes on in the hives until very late at night, according to the amount of nectar gathered during the day. The work is characterised by a heavy, continuous humming sound in the apiary. Where there is sufficient comb space in the hive to enable the bees to

place comparatively thin layers of fresh nectar in the cells for ripening, evaporation is very rapid. When the nectar has been converted and thoroughly ripened into honey and the comb cells become filled with the concentrated sweet the hive bees seal over the storage cells with a thin dome-shaped capping of wax, which they secrete from glands on the undersides of their bodies.

The average chemical constituents of ripe New Zealand honeys are as follows:—

	Per cent.		Per cent.
Dextrose ..	36.2	Water ..	17.5
Levulose ..	40.0	Ash ..	0.18
Sucrose ..	2.8	Dextrins, etc.	3.32

Factors Affecting Keeping Quality

Though the keeping quality of honey varies slightly according to its floral source and seasonal conditions when it was produced, no honey should be removed from the hives for extracting from the combs during a honey flow before it is thoroughly ripened and capped over by the bees. If this rule is not adhered to, there is danger of taking honey from which the normal amount of moisture has not been removed, resulting in a low-grade product which may ferment quickly when placed in storage for long.

It is also very important to keep all honey utensils clean and sterile. Honey may be spoiled by added moisture absorbed while the honey is exposed to a damp atmosphere or by moisture accidentally introduced by the beekeeper during extracting operations.

It is a bad practice to store full combs for long during wet weather before extracting the honey or to leave liquid honey exposed in open containers. To obtain a product of good keeping quality cleanliness and dry conditions wherever honey is exposed are essential.

Whether the beekeeper produces section, comb, or extracted honey none should be removed from the hives until it is fully capped by the bees. Though extracting combs may be left on the hives for some time before harvesting if necessary, it is desirable to remove all section honey immediately it is fully capped, to prevent travel stains caused by bees moving up and down through the supers. Any unfinished sections should be assembled in a separate super and returned to the hives at once to be finished.

Safe Removal of Honey

The most effective and safe method for domestic beekeepers to remove



Method of placing escape board in position to clear the super of bees.

surplus honey from the hives is the use of a Porter bee escape fitted into a flat board cleated on one side to provide a bee space as illustrated, and made to the top dimensions of the hives in use. The bee escape is a small metal trap or spring through which the bees can pass only one way, and once they leave the super by this means they cannot return. To place the board in position, loosen the top super with a hive tool, tilt the super up with one hand so that it rests on one end, and slide in the escape board as far as it will go; then let the super rest gently on it and straighten both the board and super into alignment with the hive. With practice the operation can be completed in a few seconds without undue disturbance of the bees, which is most important where they are kept in residential areas. When bees are shut off from the colony below in this manner they will not rest until they find an exit, which they eventually do by passing down through the flexible outlet in the escape board. Should there be brood in the super, however, the bees will not leave. The usual practice is to place escape boards on the hives late in the day and remove the honey supers early the following morning, when they are usually free of all bees.

Information on the purchase of Porter bee escapes and the construction of escape boards may be obtained from local Apiary Instructors of the Department of Agriculture.

Propagating Shrubs for the Flower Garden by Cuttings

THOUGH a very wide variety of shrubs can be propagated readily by cuttings, comparatively few home gardeners in New Zealand seem to take advantage of this remarkably easy method of increasing stocks of their favourite shrubs or replacing those no longer required. Horticultural research and experiment have brought much knowledge about propagating by cuttings and have, in fact, given a reasonable indication that with a little more knowledge of environment almost any tree or shrub can be multiplied successfully by this method. In this month's article for the flower gardener C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, discusses the selection, time of taking, preparation, insertion, and after-care of cuttings.

PROPGATION by cuttings is undoubtedly the easiest and quickest method of increasing stocks of most shrubs. It is the method most favoured by nurserymen and professional gardeners and one which can be recommended to the home gardener.

Advantages of Cuttings

Cuttings have certain advantages over seeds for propagation. A cutting is a piece which has been cut completely away from a selected parent and which, if given the proper conditions and care, will eventually strike roots and grow into a plant resembling that parent in all respects. In propagating by seeds the possibility of variation in the offspring is always present, especially if the parent plant is a hybrid or a species which mutates or hybridises readily. A satisfactory plant is developed more quickly from a cutting than from a seedling.



[Douglas Elliott photo.
Magnolia liliiflora (above) and its relatives *M. salicifolia* and *M. sollangeana* can be propagated in the manner suggested in this article.

Shrubs showing some particular form, such as weeping, dwarf, upright, or variegated, show great variations if propagated by seed, but remain true to type if propagated by cuttings. Many hybrid shrubs do not produce fertile seed, and others do not set seed until they have reached a considerable age.

Selection of Cuttings

A common mistake of amateur gardeners is to select wood for making cuttings from the most strongly growing parts of shrubs. This should be avoided unless a propagating case with bottom heat can be provided, because such wood is usually too soft and sappy and the leaves wilt soon after the cuttings have been made and inserted in the rooting medium, and eventually die off.

The best cuttings are made from shoots which are healthy, show no symptoms of disease, have all the characteristics of the parent plant, and are in normal growth.

Cuttings can be made at several stages of wood maturity, probably the most popular being the fully matured or hard-wood stage; cuttings of this type are taken from wood matured during the current season and are inserted during early winter. However, this article deals with half-ripe cuttings of green to semi-matured wood taken from near the tips of the cur-



[Douglas Elliott photo.

Fremontia mexicana (above) and its relative *F. californica* are two of the great number of flowering shrubs that can be propagated easily by the amateur.

rent season's growth. Such cuttings can be made and inserted during late summer and autumn—from January to March.

The correct appearance and feel of wood selected for half-ripe cuttings are difficult to describe. It should be neither too old and hard, nor too young and soft. An amateur may gain experience by taking cuttings of varying age, thickness, and hardness, inserting them at intervals of about a week, and making a record of which types prove most successful.

Ornamental Shrubs which can be Propagated by the Method Described in this Article

<i>Abelia chinensis</i>	<i>Enkianthus campanulatus</i>	<i>Mitraria coccinea</i>
<i>Abutilon megapotamicum</i>	<i>Erica darleyensis</i>	<i>Nuttallia cerasiformis</i>
<i>Akebia lobata</i>	<i>Erica tetralix</i>	<i>Olearia chathamica</i>
<i>Amelanchier alnifolia</i>	<i>Eloryphia intermedia</i>	<i>Oemanthus delavayi</i>
<i>Arctostaphylos tomentosa</i>	<i>Fatsia japonica</i>	<i>Osteomeles schuerinae</i>
<i>Aristolochia moupinensis</i>	<i>Feijoa sellowiana</i>	<i>Passiiflora caerulea</i>
<i>Aucuba japonica</i>	<i>Fremontia californica</i>	<i>Pernettya mucronata</i>
<i>Berberidopsis corallina</i>	<i>Gaultheria hispida</i>	<i>Philadelphus mexicanus</i>
<i>Berberis darwini</i>	<i>Gaultheria shallon</i>	<i>Photinia glabra rubens</i>
<i>Berberis stenophylla</i>	<i>Hydrangea arborescens</i>	<i>Pieris taiwanensis</i>
<i>Buddleia alternifolia</i>	<i>Hydrangea hortensis</i>	<i>Potentilla fruticosa</i>
<i>Buddleia davidi (variabilis)</i>	<i>Hyssopus officinalis</i>	<i>Prunus subhirtella</i>
<i>Cassinia fulvida</i>	<i>Jasminum nudiflorum</i>	<i>Raphiolepis umbellata</i>
<i>Ceanothus dentatus</i>	<i>Jasminum primulinum</i>	<i>Rhododendron augustini</i>
<i>Choisya ternata</i>	<i>Jasminum wallichianum</i>	<i>Rhododendron campanulatum</i>
<i>Cistus skaubergi</i>	<i>Kalmia latifolia</i>	<i>Rhodotypos kerrioides</i>
<i>Clethra alnifolia</i>	<i>Koeleruteria paniculata</i>	<i>Salvia grahami</i>
<i>Clethra arborea</i>	<i>Lavandula spica</i>	<i>Skimmia japonica</i>
<i>Correa alba</i>	<i>Lithospermum diffusum</i>	<i>Spiraea japonica</i>
<i>Coloneaster serotina</i>	<i>Lonicera hildebrandiana</i>	<i>Staphylea colchica</i>
<i>Daphne mezereum</i>	<i>Magnolia liliiflora</i>	<i>Styrax japonicum</i>
<i>Desfontainea spinosa</i>	<i>Magnolia salicifolia</i>	<i>Vaccinium bracteatum</i>
<i>Deutzia gracilis</i>	<i>Magnolia sollangeana</i>	<i>Zenobia pulverulenta</i>
<i>Diervillea florida</i>	<i>Mimulus glutinosus</i>	

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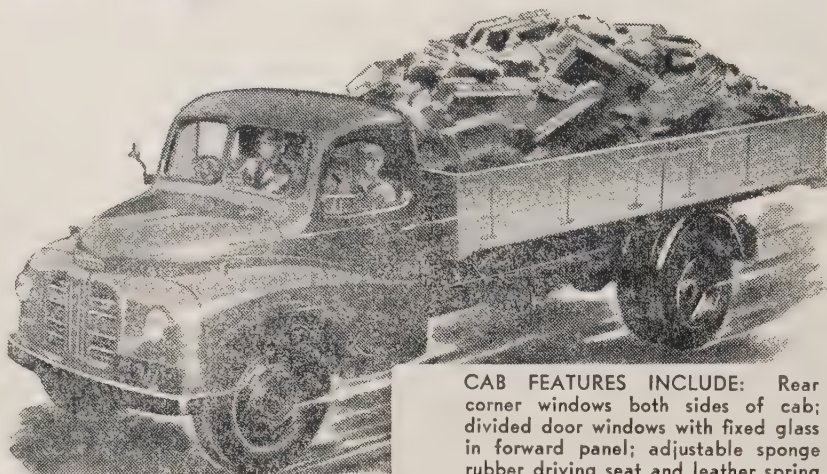
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PROPAGATING SHRUBS BY CUTTINGS

The exact time at which to take cuttings of shrubs cannot be stated because it depends on the type of shrub, the climate, occasionally the season, and whether special facilities such as heat are available as an aid to propagation. However, cuttings taken in January, February, and March can usually be relied on to root fairly readily.

The shoots from which cuttings will be obtained during those months will be leafy and the wood will be firm and beginning to ripen. Ventures by the home gardener in propagation by soft-wood cuttings taken earlier than this—in October, November, or December—usually meet with very limited success, for the full sap flow during those months causes the shoots to be very soft, and they succumb readily to any variation in conditions, wilting and dying off. Nevertheless, certain species are better propagated by such soft cuttings, but they are not included within the scope of this article.

Preparing the Cuttings

Lack of attention to preparation of the cuttings is probably the cause of most failures in propagation. A little experience in dealing with various types of shrubs soon brings success.

In almost every species the cut at the base of the cutting must be made immediately below a node (where a leaf joins the stem). The species and varieties of clematis are the notable exceptions, internodal cuttings being more successful with them.

The length of the cutting is not of great importance provided at least two nodes, and preferably three, are included, though strict adherence to that rule is impracticable with some species having closely spaced or very widely spaced nodes.

The basal cut should be made with a very sharp knife in a single stroke, for the cleaner the cut, the more readily may callus formation take place. Wood which is too hard to be cut with a single stroke should be cut with a deep slope away from the node and pared back carefully to the required angle. In brittle types of wood a notch may be made opposite the start of the cut to prevent cracking or splitting. For convenience a few of the lower leaves may be removed before the cutting is inserted. Large leaves may have their tips cut off to prevent their lying on the rooting medium. All leaves on the part of the cutting which will be below the surface of the compost must be removed, and if the species being propagated is one which suckers badly, it is advisable to cut away the lower buds as well.

Where to Root Cuttings

If a glasshouse is available, there could be no better place for the cuttings than in a small frame erected on one of the benches. A glass cover must be provided for the frame to prevent the loss of too much moisture. Almost as good is an outdoor cold frame, and if that is not available, very satisfactory results can be obtained by placing in a sheltered position in the garden a box containing about 6 in. of the rooting medium and which can conveniently be covered with glass.



[Douglas Elliott photo.]
Kalmia latifolia, the calico bush or American laurel, is one of the most beautiful of evergreen shrubs and one which can be increased with small cost and effort by the home gardener.

Probably the most satisfactory medium in which to root cuttings is finely sieved, clean, sharp sand such as is available in the beds of many rivers and streams in New Zealand. However, this medium can be used successfully only if the cuttings can be potted up immediately they have rooted, as sand contains little or no plant food. A better medium for the home gardener to use consists of equal parts of sand, loam, and leaf mould. The medium should be very thoroughly mixed, and the drainage must be good.

Insertion of the Cuttings

Most cuttings do not need to be inserted deeply in the medium. They should be deep enough to allow the compost to support them upright. The hole in which to insert the cutting may be made with a finger or a dibble, but the base of the cutting must sit firmly on the medium at the bottom, or a pocket of air is left which interferes with proper callus and root development.

After the cuttings have all been placed they and the rooting medium should be watered thoroughly with a fine spray to ensure that all the holes in the soil are filled and that adequate moisture is present. The lid of the box should be closed, or the box covered with glass, and a sheet of paper placed over the top if the frame or box is exposed to direct sunlight.

After-care of Cuttings

In general, cuttings root most readily in conditions of mild temperature and high humidity. Gentle bottom heat gives added stimulus and is most beneficial to half-ripe cuttings. Wide temperature variations should be avoided.

In hot weather the cuttings benefit from occasional syringing, which helps maintain the high humidity, but aeration should be good to reduce the possibility of rotting. The frame should not be opened or the glass removed any more than is necessary for watering or for removing cuttings that have rotted off, because such a practice leads to violent fluctuations in conditions. It is a good plan when watering occasionally to colour the water slightly with permanganate of potash, which has fungicidal properties and helps to control the growth of moulds or rots.

Direct sunlight should not be allowed to fall on the cuttings because it increases the transpiration rate of the leaves to such an extent that wilting often occurs. A cutting that wilts seldom recovers.

As soon as possible after the cuttings have rooted they should be potted up. The pot should be large enough to accommodate the roots comfortably; root growth will be rapid and extensive if the mixture is not too rich. As the cutting grows it can be potted on until it is large and strong enough to be planted out in its permanent position.



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Summer

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FLOWER GARDEN WORK FOR FEBRUARY



To give a display such as this dahlias need ample water right through their growing season.

Annuals sown during February will withstand winter conditions outdoors in most districts and make an early display next summer. Shirley poppy, larkspur, and calendulas will succeed if treated in this way, provided that in colder districts the plants do not become too large before the coldest weather sets in.

Chrysanthemums grown primarily for shows require much attention to stopping and disbudding, but for ordinary border display less attention to these points is necessary. Severe disbudding to produce a few large blooms reduces the flowering period of a plant by eliminating buds which normally would have flowered later. Single varieties give the best displays if all the buds are left on.

Dahlias grown for show blooms should also be disbudded. All flower buds except the largest or best one should be removed as soon as they are large enough to be handled. Dahlias need ample water during their growing season, and a mulch of lawn clippings or well-rotted compost about their roots assists in keeping the soil moist.

Everlasting flowers such as helichrysums, acrocliniums, and rhodanthes should be cut when in full bloom, with the stems as long as possible, and the flowers tied into bundles and hung in a shed to dry. When drying is complete and the flower stalks have hardened they should be stored in boxes away from light until they are required.

Geranium and pelargonium cuttings will root readily at any time during summer or autumn. Though geraniums are usually regarded as very ordinary flowers, they and pelargoniums make valuable shows of colour, especially when the season is dry.

Gladiolus foliage will be dying off in February in the warmer parts of the Dominion. Gladioli are best lifted

when the foliage has died down almost completely. After being lifted they should be stored in trays in an airy shed or cellar. The foliage should not be removed until it has dried off completely to ensure that all the food material has returned to the corm.

Hedges of the evergreen types should now be given their last trimming before winter. By the time cold weather sets in they should have reclothed themselves with short shoots and assumed once more a tidy, well-grown appearance. Frequent light trimmings are better than occasional hard cuttings, which make hedges unsightly and may cause fatal injury to some species.

Hoeing is necessary during February even if the garden looks weed free. Regular hoeing prevents the establishment of weeds by bringing the newly germinated ones to the surface, where they are killed by hot sunshine.

Hydrangeas may be propagated during February by tip cuttings. The cuttings can be rooted in sharp sand in a frame and later potted on to 3 or 4 in. pots. All being well, the new plants will flower in these pots next season and make useful decorative plants for the house. Last season's pot hydrangeas which have finished flowering should now be pruned by cutting off the flower head and a short section of the stem. They should then be placed outside in a warm spot where the new



Evergreen hedges should be given their last trimming of the season during February so that by the time winter sets in they will be clothed in new shoots.

FLOWER GARDEN WORK FOR FEBRUARY . . .

shoots can be allowed to grow and ripen.

Lawns should not be cut too short during dry weather, the blades of the mower being set higher than usual. Broad-leaf weeds in a lawn can be destroyed at this time of year by applying hormone weedkillers of the 2, 4-D type. Such weedkillers should be applied according to the maker's instructions on a warm, still day after rain and when the weeds are growing vigorously. Care should be taken not to allow the spray to drift on to nearby borders or vegetable plots, and the sprayer should be cleaned thoroughly after use as described in the article on lawn management in the "Journal" for October, 1950.

Marguerites are useful winter-flowering plants in all milder parts of the Dominion, but lose popularity because of their tendency to become straggly and untidy if not properly attended to. Flower heads should be removed regularly and the bushes cut hard back in late summer to encourage the production of new shoots to flower during winter. An alternative procedure is the raising of new plants each season from cuttings. Treated in either of these ways, marguerites fully repay the time spent on them.

Pot marigolds may be sown during February in boxes and pricked out when they are large enough to be handled. When they are well grown they may be used to fill in vacant spaces in the flower borders, where, in all but the coldest districts, they will provide a prolonged show of colour from mid-winter onward. These winter blooms always seem of better quality than the summer blooms.

Schizanthus (poor man's orchid or butterfly flower) is an excellent annual for a greenhouse or porch. Seed should be sown during February in pots or boxes and the seedlings pricked out into pots or boxes as soon as they are large enough to be handled.

Seedlings of sweet williams, Canterbury bells, and wallflowers sown during January should be big enough to be handled in February. They should be lifted and planted about 3in. apart in a nursery bed where they can be allowed to grow into strong, well-rooted plants which will transplant with ease when required for planting out into their winter quarters. If the soil is dry, the nursery beds and rows of seedlings should be watered thoroughly the day before they are set out.

LODER CUP AWARD

THE Loder Cup, presented to "lovers of nature in New Zealand to encourage the protection and cultivation of the incomparable flora of the Dominion", has been awarded for 1950 to Mr. A. P. Harper, of Wellington. Now 85 years of age and still active, Mr. Harper has become almost a legendary figure in New Zealand because of his pioneer exploration in the Southern Alps, and particularly in south Westland.

Sweet pea seeds for early-flowering plants should be sown in February ½in. deep and 3in. apart in a soil which has been deeply cultivated and enriched with well-rotted compost and superphosphate. Rubbing the seed two or three times lightly across a piece of sandpaper hastens germination, the injury to the testa or seed coat allowing water to be absorbed more rapidly.

Violas which were cut back as recommended in last month's article will by now have produced a number of short, strong shoots from each crown. These make ideal cuttings which will root in a shady place outdoors if the soil is kept moist and the cuttings are syringed lightly with water on hot days. The lower leaves should be removed from each cutting and the stem cut off cleanly with a

sharp knife immediately below a node—that is, where a leaf joins the stem.

Watering is a most important task in most parts of New Zealand during late summer. To be truly beneficial watering must be done with some care. Playing the hose over the soil until the surface looks wet and then moving on to another part is useless, for this method merely dampens the top ½in. or so of the soil and encourages the roots of plants to move up into this zone to obtain moisture. The most efficient method of watering is to set the hose in one position and allow it to play gently over the area until the water has soaked right through to the subsoil. Occasional watering in this manner does infinitely more good than daily sprinklings.

Pests and Diseases

Subterranean grass caterpillars will be active now. They are grey-black caterpillars with black heads, of nocturnal habit, and 2½ to 3in. long when fully grown. They burrow holes in the lawn in which they hide during the day, emerging by night to feed on the grasses. They are voracious feeders, and in extreme cases the soil becomes bare and perforated with holes about the diameter of a pencil. Poison baits have been found most effective in controlling this pest; 2lb. of wheat bran mixed thoroughly with 2oz. of arsenate of lead powder or 1oz. of paris green, moistened slightly, makes sufficient to broadcast over 1500 sq. ft. of lawn. Both arsenate of lead and paris green are extremely poisonous substances and the greatest care should be exercised in using them, especially where there are young children or pets. An excellent alternative to the laying of baits is the application of one of the proprietary preparations of benzene hexachloride in powder form at 2oz. per square yard.

Leaf-chewing caterpillars: A close watch should be kept on all ornamental plants for evidence of attack by these pests. At first sign of damage lead arsenate or another poison spray such as D.D.T. should be applied.

Euonymus europaeus

MORE popularly known as the spindle tree, *Euonymus europaeus* is a firm favourite among the many deciduous and evergreen species of *Euonymus*. This deciduous species grows reasonably well in a variety of positions in the garden, but it prefers a sunny aspect to give of its best. It may ultimately grow to between 10 and 20ft. high, but with judicious pruning in spring it can be kept to suitable dimensions.

Well known to many gardeners are the masses of pendant clusters of showy, pinkish-red fruits which are carried in autumn and early winter, together with some foliage which also takes on fine autumn tints. It is a shrub to be recommended for both outdoor and indoor decoration.

To propagate the plants ripe seeds may be sown in a frame in spring. If germination is found to be slow, they could be sown in pots or boxes in autumn, kept in the open during winter, and subsequently removed to a warm greenhouse or frame in spring. Layering may also be resorted to. However, the usual procedure is to propagate by hard-wood cuttings (that is, ripened wood of the current year's growth) 9 to 12in. long and about the thickness of a lead pencil, planted out in March.

—H. P. THOMAS, Vegetable Instructor,
Department of Agriculture, Wanganui.



Eggs are a Versatile Food

EGGs are a valuable food and, though they are often associated only with breakfast, they can be served in a form suitable at any meal and combine well with many different foods. Even when eggs are scarce on the market the country housewife usually has sufficient for ordinary purposes; when they are plentiful they may be enjoyed in some of the ways described in this article by Eva Topping, Rural Sociologist, Department of Agriculture, Auckland.

FOR lunch or a substantial tea on Sunday night egg dishes are a change from meat, 2 eggs making an excellent substitute for an average serving of meat or fish. When children, invalids, or elderly people are to be catered for eggs are invaluable, and some recipes are included for these groups.

Hearty Egg Dishes

The quantities given in the recipes are sufficient for 3 to 4 servings.

Egg Rissoles

- | | |
|---------------------------------------|--------------------------------------|
| 2 tablespoons of minced onion | 1 beaten egg |
| 3 tablespoons of flour | Dry, fine breadcrumbs |
| $\frac{1}{2}$ teaspoon of dry mustard | 3 tablespoons of butter or bacon fat |
| 1 cup of milk | Salt and pepper |
| | 6 hard-boiled eggs |

Cook the onion in the butter or fat until it is clear and tender but not browned. Stir in the flour and seasonings, then the milk, and cook the mixture, stirring constantly, until it is very thick. Add the hard-boiled eggs chopped finely and set the mixture aside to cool thoroughly. Form it into 10 round cakes. Dip each in the beaten egg mixed with a little water, roll them in the crumbs, and fry them until they are golden brown in fat about $\frac{1}{2}$ in. deep and hot enough to have a faint blue smoke rising from it.

Spanish Eggs

- | | |
|---|---------------------------------|
| $\frac{3}{4}$ cup of cooked rice | Salt and pepper |
| $\frac{1}{2}$ cup of brown sauce (a good thickened gravy) | 1 tablespoon of chopped parsley |
| 1 tablespoon of butter | 1 tablespoon of lemon juice |
| | 6 eggs |

Cook the rice in boiling water, drain it, then add the butter, salt, and pepper, and arrange it on a hot dish. Keep the rice hot while the eggs are being poached in boiling water to which the lemon juice has been added and the gravy is being heated. Place the eggs on the rice, pour the gravy round it, and sprinkle the eggs and rice with chopped parsley.

Roman Eggs

- | | |
|-------------------------------------|--|
| 1 large onion, chopped finely | 4 eggs |
| $\frac{1}{2}$ cups of boiled rice | $\frac{1}{2}$ cups of white sauce |
| 1 tablespoon of butter or bacon fat | 4 tablespoons of flour |
| Salt and pepper | 1 pint of tomato puree or tomato juice |
| 1 teaspoon of celery salt | 2 tablespoons of grated cheese |
| 2 tablespoons of bacon fat | |

Melt the 2 tablespoons of bacon fat and gently cook the chopped onion in it until it is clear but not browned. Add the boiled rice and white sauce, stirring constantly, and cook the mixture until it is well heated. This part of the cooking is best done in a double boiler. Turn the mixture into a greased, oval, oven-glass dish or an oblong tin and keep it hot

Prepare the tomato sauce. Heat the butter or bacon fat in a saucepan, stir in the flour, and cook the mixture until it is frothy. Then add the tomato juice or puree, continuing to stir until it boils. Add the salt, celery salt, and pepper, and then the grated cheese. Simmer the sauce gently for about 5 minutes, stirring it constantly. Take the saucepan off the direct heat, but keep the sauce hot while the eggs are being poached.

Turn the rice mixture on to a hot, flat dish, put the eggs on top, and pour the sauce round them. Garnish the dish with sprigs of parsley.

Egg-and-vegetable Souffle

- | | |
|---|----------------------------|
| 2 cups of mixed cooked vegetables, such as peas, carrots, beans, and cauliflower sprigs | 4 eggs |
| 1 cup of grated cheese | 6 tablespoons of butter |
| | $\frac{1}{2}$ cup of flour |
| | 1 cup of milk |
| | Salt and pepper |

Put the vegetables in a casserole with 2 tablespoons of butter.

Melt the rest of the butter in a saucepan, add the flour, and cook it until it is bubbly. Add the milk gradually, stirring constantly, and cook the mixture until it is thick; then add the cheese and stir until it melts. Take the pan from direct heat. Beat the egg whites until they are stiff. Add the hot sauce to the yolks; mix in the seasonings, and fold the mixture into the egg whites.

Pour the prepared mixture over the vegetables, stand the casserole in a pan of water in a moderate oven (325 degrees), and bake the souffle for about 1 hour. To test it, insert a knife blade; if it can be withdrawn without any particles of food sticking to it, the souffle is cooked.

Heading photograph by Sparrow Industrial Pictures Ltd

EGG RECIPES: SOUFFLES, SOUPS, AND SALADS . . .

Curried Eggs and Cheese on Toast

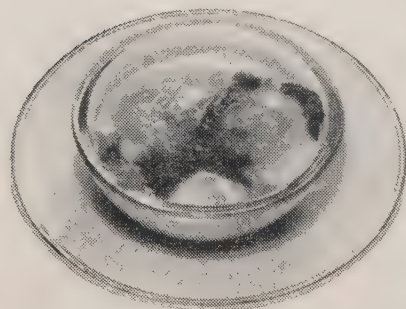
½ lb. of grated cheese
 ½ teaspoon of curry powder
 1 hard-boiled eggs
 1 slices of bread
 1 tablespoon of grated onion
 1 teaspoon of mixed mustard
 Salt and pepper
 Butter

Mash the eggs with a fork and combine them with the grated cheese, onion, curry powder, and seasonings.

Toast the bread on one side and spread the other side with butter. Pile the egg mixture on top and grill it until the cheese bubbles and the mixture is lightly browned—3 to 5 minutes.

Individual Egg Dishes

Baked Eggs



8 strips of bacon
 2 teaspoons of Worcestershire sauce
 8 eggs
 Salt and pepper
 4 teaspoons of tomato sauce

Fry the strips of bacon until they are crisp. Put 2 strips crosswise in each of 4 small ovenware dishes. Put 1 teaspoon of tomato sauce in each dish, then break in 2 eggs. Pour the rest of the sauce and the seasoning over the tops and bake the eggs in a moderate oven (350 degrees) until they set—about 25 minutes.

Surprise Souffle

3 tablespoons of butter
 Salt
 ½ cup of milk
 3 tablespoons of flour
 8 eggs
 Cayenne pepper to taste
 1 cup of grated cheese

Beat 4 of the egg whites until they are stiff.

Melt the butter and stir in the flour and seasoning. Add the milk slowly while stirring continually and cook the mixture until it is thick and smooth. Take the pan from the heat and stir the cheese and 4 unbeaten egg yolks into the mixture. Fold in the stiffly beaten egg whites.

Half fill 4 greased custard cups with the mixture, break an egg into each cup, and cover them with the rest of the cheese mixture. Bake the souffles in a hot oven (400 degrees) for about 20 minutes and serve them immediately.

Bird Nests

2 cups of cold mashed potatoes
 5 eggs
 Dry breadcrumbs
 1 cup of minced ham
 1 tablespoon of butter
 Salt and pepper

Mix the ham with the cold mashed potatoes. Form the mixture into balls, flatten them, and make a depression in the top of each. Brush the "nests" with beaten egg mixed with a little water and sprinkle them thickly with dry breadcrumbs. Set them on a well-greased, flat baking dish. Break an egg into each nest, put a little butter on each, and sprinkle them with salt and pepper. Bake them in a moderate oven (325 degrees) until they are well heated and the eggs are set.

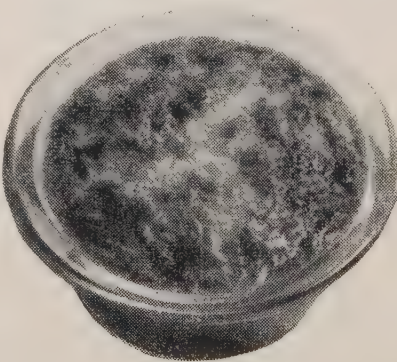
Served with fresh green peas, bird nests make an appetising lunch dish.

Egg Ramekins

1 eggs
 8 tablespoons of soft breadcrumbs
 Pepper
 A few leaves of thyme
 6 tablespoons of thin cream
 1 teaspoon of salt
 1 dessertspoon of chopped parsley

Mix the breadcrumbs with the salt, pepper, and cream. Divide half the mixture between 4 greased ramekins or custard cups. Sprinkle them with parsley and thyme, then break 1 egg into each dish. Cover them with the rest of the breadcrumb mixture and bake them for 6 to 8 minutes in a moderate oven (350 degrees), the time depending on how "set" the eggs are required.

Egg-and-cheese Casseroles



4 eggs
 Salt and pepper
 ½ lb. of grated cheese
 1 cup of milk
 ½ teaspoon of dry mustard
 2 tablespoons of minced onion

Break the eggs into a bowl, add the onion and seasoning, and beat them together. Add the cheese and milk and beat the mixture well. Pour it into 4 greased custard cups. Set them in a pan of warm water reaching nearly to the tops of the cups and bake the casseroles in a moderate oven (325 to 350 degrees) for about 30 minutes.

Soups

Eggs are apparently an unlikely food from which to make soup, and they are more often used as garnishes.

Egg Soup

½ cup of minced onion
 ½ cup of flour
 ½ teaspoon of pepper
 6 hard-boiled eggs cut in thick slices
 ½ cup of butter
 2 teaspoons of salt
 ½ teaspoon of ground allspice

Cook the onion slowly in the butter in a saucepan until it is clear but not browned. Add the flour and seasonings, stirring until the mixture is smooth. Add the milk slowly while stirring and cook the mixture until it is thickened and for a further 3 minutes. Add the eggs and heat them thoroughly. Keep the soup stirred during the whole preparation time or it will burn or become lumpy.

If it is available, 2 tablespoons of a white wine is an excellent addition to this soup.

Custard Dice for Clear Soup

½ pint of soup stock
 1 whole egg
 2 egg yolks
 Salt and pepper

Beat the egg and yolks well, season them, and mix them with the stock. Pour the mixture into a small, well-greased, round dish and bake it in a pan of water in a slow oven until it is set. Cool the custard, turn it on to a board, and cut it into tiny diamonds, cubes, or rounds made with a thimble or glass tube. Put the custard shapes into soup bowls and pour hot clear soup over them.

Noodles for Chicken Broth

Add a beaten egg and ¼ cup of water to 3 tablespoons of salted flour. Beat the mixture well until it is smooth. Pour it very slowly from the tip of a tablespoon into the boiling broth. Put the lid on the saucepan, boil the broth quickly for 3 minutes, and then serve it.

Golden Dumplings for Clear Soup

3 eggs
 1 teacup of flour
 Milk
 Grated nutmeg
 2 tablespoons of butter
 Pepper and salt

Break the whites of the eggs into a teacup and fill the cup with milk. Melt the butter in a saucepan and stir in the flour; then add the milk and egg whites. Continue stirring the mixture over heat until it leaves the sides of the pan clean. Take the pan from the heat, leave the mixture to cool, then beat in the yolks of the eggs and the other ingredients. Drop the mixture by teaspoonfuls into the boiling soup, cover it, and boil it for 5 minutes.

Salads and Salad Dressings

Rosy Egg Salad

6 hard-boiled eggs
 2 medium-sized cooked beetroot
 Celery salt
 Lettuce leaves
 Mayonnaise
 2 cups of cold boiled rice
 ½ teaspoon of grated onion
 Salt and pepper

Cut the eggs and beetroot into dice and mix them with the rice, salt, pepper, celery salt, and onion. Turn the salad lightly with a fork while pouring in the mayonnaise. Serve it in lettuce-leaf cups.

Individual Jellied Egg Salad with Green Peas

4 hard-boiled eggs
 1 cup of cooked green peas
 Pepper
 1 tablespoon of gelatine crystals
 Mayonnaise
 1 teaspoon of minced onion
 About 1 teaspoon of salt
 Lettuce, parsley, mint

Soften the gelatine with ¼ cup of cold water, stand it aside for 15 minutes, then pour 1½ cups of boiling water over it. Let the gelatine stand until it is cool, then add the onion, salt, pepper, and ½ flat teaspoon of chopped mint.

[Photographs on this page by Sparrow Industrial Pictures Ltd.]

Pour a little gelatine into each of 4 moulds and arrange some slices of egg in it. Pour a very little more gelatine over the egg and leave it until the gelatine is nearly set. Put in a layer of green peas and more gelatine, continuing with alternate layers of egg slices and peas until the moulds are full. Unmould the salads, set them on lettuce leaves, sprinkle them with chopped parsley, and serve them with mayonnaise dressing.

Salad Dressing that will Keep

- | | |
|------------------|-------------------|
| 2 eggs | 1 teaspoon of dry |
| 1 tablespoon of | mustard |
| butter | 2 tablespoons of |
| 4 tablespoons of | sugar |
| vinegar | Salt and pepper |

Beat the eggs well and add the mustard, vinegar, sugar, salt, and pepper. Melt the butter over low heat in a double saucepan or in a bowl standing in a saucepan of boiling water. Add the egg mixture and cook the dressing very gently, stirring continually, until it is thickened. The mixture should not boil or it will curdle.

Dilute a portion of the dressing with top milk, milk, or cream when required.

Mayonnaise Dressing

- | | |
|-----------------------|---------------------|
| 3 egg yolks | 1 teaspoon of mixed |
| 1 cup of salad oil | mustard |
| 1 tablespoon of icing | 4 tablespoons of |
| sugar | vinegar |
| 1 teaspoon of salt | |

Beat the egg yolks in a basin until they are creamy and pale. Gradually stir in the sugar, salt, and mustard. Add the oil drop by drop. When the mixture is smooth and thick add the vinegar gradually.

Economical Salad Dressing

- | | |
|-------------------|--------------------|
| 2 tablespoons of | 1 teaspoon of salt |
| butter | 3 egg yolks |
| 1 tablespoon of | 1 cup of milk |
| castor sugar | 1 teaspoon of dry |
| 1½ tablespoons of | mustard |
| flour | 1 cup of vinegar |

Melt the butter and add the flour. Add the milk slowly and cook the mixture until it thickens, stirring continually.

Mix together the egg yolks, salt, pepper, and mustard. Heat the vinegar, pour it over the egg mixture, put them back into the pan, and cook them, stirring continually, until the mixture has thickened.

Blend the two mixtures thoroughly and store the dressing in a glass jar. It will keep for a week if stored in a cool place. Thin it with cream when it is required for use.

Small Savouries

Egg-and-cheese Fritters

- | | |
|-----------------------|---------------------|
| 4 eggs | 1 level teaspoon of |
| ½ cup of flour | baking powder |
| 4oz. of grated cheese | About ½ cup of fat |
| 1 tablespoon of | for frying |
| chopped onion | Salt |

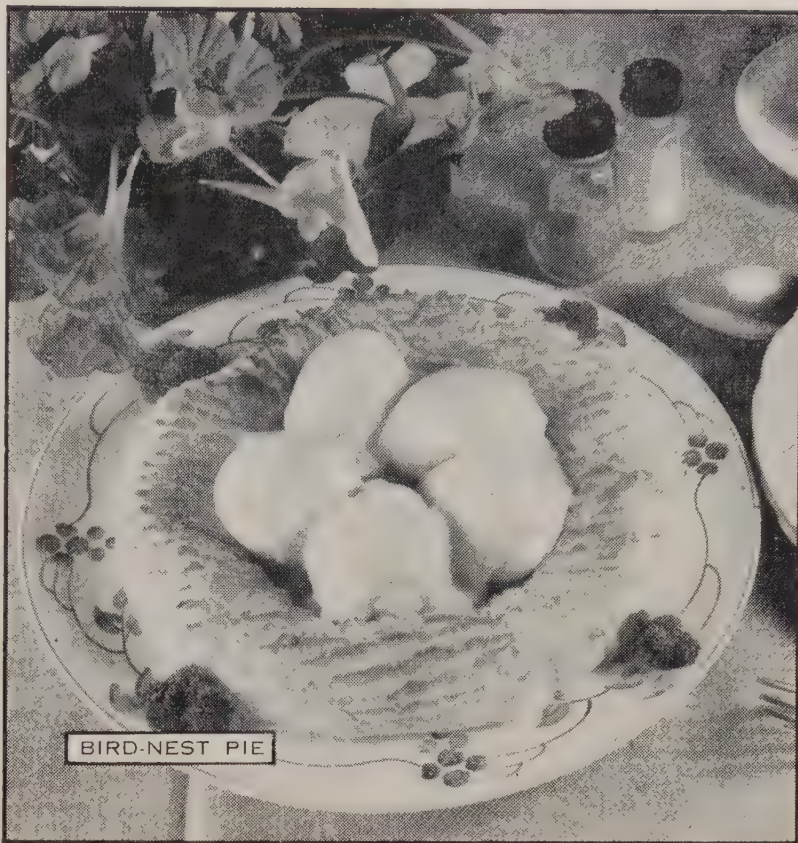
Beat the eggs and add the flour, salt, baking powder, and onion while still beating. Stir in the cheese. Drop the mixture by spoonfuls into heated fat and fry the fritters until they are golden brown on both sides. There should be about 12 fritters from this quantity.

Egg-and-cheese fritters are delicious served with fried sliced tomatoes.

- | | |
|-----------------------|----------------------|
| 6 hard-boiled eggs | 2 tablespoons of |
| 1 tablespoon of | butter, melted |
| chopped parsley | Leaves from 1 sprig |
| 1 teaspoon of grated | of thyme |
| lemon rind | A pinch of grated |
| 1 beaten egg | nutmeg |
| Pastry (short, flaky, | Salt and pepper |
| or rough puff) | 1 tablespoon of |
| | finely grated cheese |

Cool the eggs and cut them in halves lengthwise. Dip them in melted butter and sprinkle them with a mixture of chopped parsley, thyme, lemon rind, nutmeg, salt, and pepper. Roll out the pastry very thinly and cut 24 ovals. Place a half egg on one oval, cover it with a second piece of pastry, moisten the pastry edges, and pinch them together. Brush each puff with well-beaten egg and sprinkle them with the

EGG RECIPES



BIRD-NEST PIE

[Sparrow Industrial Pictures Ltd. photos.]

Egg Puffs

grated cheese. Bake them in a hot oven (400 degrees) until they are crisp and lightly browned.

The puffs may be eaten hot as a savoury, or cold for picnics or for lunch with a salad.

Ham-and-egg Balls

- | | |
|--------------------|----------------|
| ½ lb. of lean ham | ½ teaspoon of |
| 3 hard-boiled eggs | chopped chives |
| Salt and pepper to | Mayonnaise |
| taste | |

Mash the yolks of the eggs, add the chives, salt, and pepper, and mix them to a smooth paste with a little mayonnaise. Mince the ham, using the finest grinder of the mincer, and chop the whites of the eggs finely. Blend the ham and egg whites with the yolk paste, adding just sufficient mayonnaise to make a firm paste. Form the mixture into tiny balls and put a toothpick in each one.

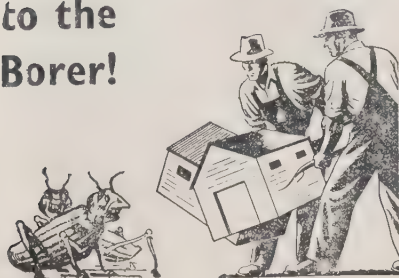
Stuffed Eggs

- | | |
|--------------------|------------------|
| 4 hard-boiled eggs | Curry powder and |
| Butter | salt to taste |
| 8 stuffed olives | |

Cool the eggs, cut a slice from each end, and then cut them in halves crosswise. Remove the yolks and mash them with butter to make a soft paste. Add curry powder and salt according to taste. Fill the egg whites with the yolk mixture and set a stuffed olive on top of each half. Arrange them on a dish on lettuce leaves or with sprigs of watercress.

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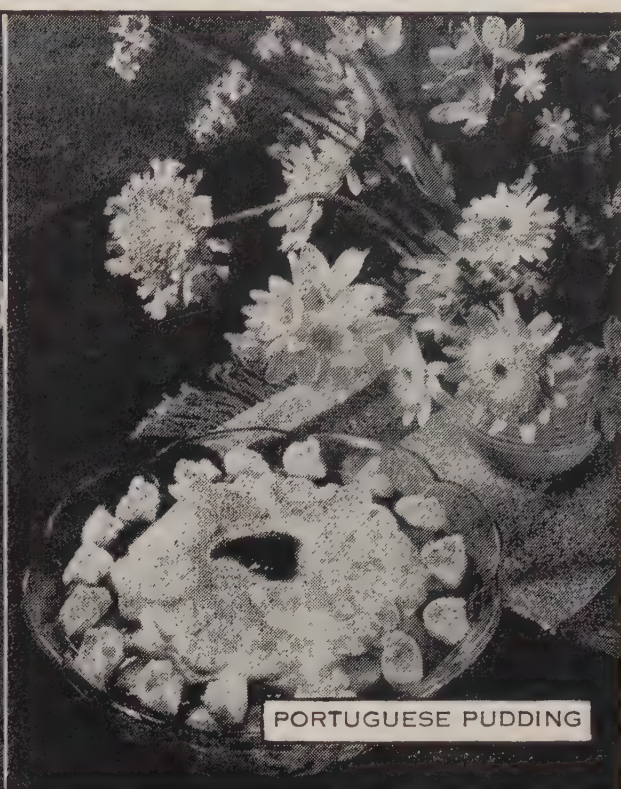
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EGG RECIPES



ROSY EGG SALAD



PORTUGUESE PUDDING

[Sparrow Industrial Pictures Ltd. photos.]

Pies and Tarts

Bacon-and-egg pies are too well known to need description, so here are some variations:—

Egg Pie

Mashed potatoes Tomatoes
Breadcrumbs Gherkins or capers
5 or 6 eggs Salt and pepper

Grease an ovenware dish and line it with breadcrumbs. Put in a layer of sliced tomatoes, sprinkle them with salt and pepper, and cover them with a thin layer of mashed potatoes. Break the eggs on the potatoes and put in some chopped gherkins or capers. Cover the eggs with breadcrumbs, sliced tomatoes, and a thin crust of potatoes, and cover the pie well with breadcrumbs. Dot the top with butter and bake it for about 20 minutes in a moderately hot oven (375 degrees).

Egg-and-macaroni Pie

1 cup of macaroni 1 cup of soft
1 onion, minced breadcrumbs
½ cup of grated 3 eggs
cheese ½ teaspoon of salt
½ cup of butter Pepper
1½ cups of milk Flaky pastry

Cook the macaroni in 2 to 2½ cups of boiling water until it is soft and the water is nearly all absorbed; add the minced onion and grated cheese. Heat the milk, pour it over the breadcrumbs, and add the eggs, well beaten, and the seasonings. Line a pie plate with flaky pastry, pour in the filling, and bake the pie in a hot oven (425 degrees) until the pastry is cooked and the top of the filling is nicely browned (about 30 minutes).

Bird-nest Pie

1½ lb. of potatoes 1 tablespoon of
5 lightly boiled eggs butter
1 dessertspoon of 1 tablespoon of milk
grated cheese Salt and pepper
Parsley 1 beaten egg

Boil the potatoes, drain them, and mash them with the butter, milk, salt, and pepper. Shape half the amount into a flat round on an ovenware dish. Build up the remainder to an inch-wide rim and score it with a fork. Brush the "nest" with the beaten egg and brown it lightly in the oven or under the grill.

Shell the boiled eggs, arrange them in the nest, pour the sauce over them, and sprinkle them with grated cheese. Brown the pie quickly and serve it garnished with parsley.

The sauce is made as follows:—

½ teaspoon of mixed Pinch of nutmeg
herbs 1 slice of carrot
1 small onion 1 tablespoon of flour
1 tablespoon of Salt and pepper
butter 3 cloves

Put the herbs, carrot, onion, nutmeg, and cloves into a saucepan with the milk. Cover the pan, simmer the mixture gently until the milk is well flavoured, then strain it. Melt the butter in the saucepan, add the flour, and stir in the flavoured milk gradually until boiling point is reached. Simmer the sauce for 3 minutes.

Puddings and Desserts

Portuguese Pudding

4 eggs 3oz. of gelatine
½ pint of milk 1 tablespoon of sugar
Strawberry jam Whipped cream

Beat the yolks of the eggs with the sugar until they are light in colour. Soften the gelatine in a little cold milk, then add it to the rest of the milk which has been heated to near boiling point. Cool the milk, and when it is quite cold add it to the beaten egg yolks.

Whip the whites until they are very stiff and fold them into the yolk mixture, mixing the whole thoroughly. Pour the mixture into a serving dish and leave it aside in a cool place until it is set. Spread the top with strawberry jam and decorate the pudding with whipped cream just before serving it.

Chiffon Pie

1 dessertspoon of 3 eggs, separated
gelatine ½ teaspoon of salt
1 cup of milk 1 cup of thin cream
A baked pastry pie 1 cup of sugar
shell about 9in. in 2 teaspoons of rum
diameter essence

Soften the gelatine in ¼ cup of cold water. Scald the milk and cream; beat the egg yolks with 1/3 cup of sugar and the salt, and add the scalded milk and cream slowly while stirring continually. Cook the mixture over water until it is thick enough to coat the back of a wooden spoon, but do not allow it to boil. Remove the pan from the heat and add the gelatine, stirring until it is dissolved. Add the flavouring when the mixture is cool, and chill it until it is beginning to set.

EGG PUDDINGS AND SAUCES . . .

Meanwhile beat the egg whites stiffly with the other $\frac{1}{3}$ cup of sugar. Fold them into the semi-set mixture and pour it into the pie shell.

Lemon Cream

2 tablespoons of sugar 3 lemons
6 eggs

Grate the rind of 1 lemon. Squeeze the 3 lemons and strain the juice into a saucepan. Add the grated rind, sugar, and egg yolks. Stir these ingredients over gentle heat until they thicken, but do not boil them. Beat the egg whites stiffly and stir them into the lemon-and-egg mixture. Pour the sweet into a glass dish and serve it with thin cream, whipped cream, or the fluffy sauce for which the recipe is given in the next section.

Sauces, Sweet and Savoury

Foamy Sauce

2 eggs 1 cup of cream
1 cup of sugar

Beat the eggs until they are thick and creamy and add the sugar gradually while still beating. Whip the cream until it is very stiff, then fold

in the egg-and-sugar mixture. Chill the sauce and serve it with fresh or stewed fruit or fruit pies.

Use only hen eggs, as the recipe does not require the eggs to be cooked.

Custard Sauce

2 egg yolks Vanilla flavouring to taste
 $\frac{3}{4}$ pint of milk
1 tablespoon of sugar

Bring the milk to boiling point, cool it for a minute or two, then stir in the beaten egg yolks. Continue stirring the custard over heat until it is thick, but do not let it boil. Stir in the sugar and flavouring.

Fluffy Sauce

$\frac{3}{4}$ pint of custard sauce 2 egg whites
1 dessertspoon of castor sugar 2 tablespoons of cooking brandy or sherry

Make the custard sauce by the previous recipe. When it has thickened stir in the stiffly beaten egg whites, sugar, and brandy, and serve it at once.

The sauce is delicious on plum pudding or stewed or fresh fruit.

Savoury Egg Sauce

2 hard-boiled eggs $\frac{1}{2}$ teaspoon of lemon juice
 $\frac{1}{2}$ pint of milk
1 oz. of flour
1 oz. of butter Pepper and salt

Make a thin white sauce with the flour, butter, and milk. Add the chopped hard-boiled eggs and then stir in the lemon juice, salt, and pepper.

Serve the sauce with boiled chicken, or boiled or steamed fish.

Dutch Sauce

1 oz. of butter 2 egg yolks
 $\frac{1}{2}$ pint of water or white stock Salt, pepper, and lemon juice to taste
 $\frac{1}{2}$ oz. of flour

Melt the butter, stir in the flour, then the stock or water, and boil the mixture for 3 minutes. Take the saucepan from the heat and beat in the egg yolks. Add salt, pepper, and lemon juice.

Serve Dutch sauce with asparagus, boiled fish, or egg dishes.

Dishes for Children or Invalids

Fish in Custard

1 lb. of filleted fish 1 flat tablespoon of flour
 $\frac{1}{2}$ pint of milk
2 teaspoons of butter Salt
2 eggs

Melt half the butter and add the flour, salt, milk, and beaten eggs. Put the fish in an ovenware dish and pour the mixture over it. Dot the top with the rest of the butter and bake the fish very slowly until the custard is set.

These quantities are sufficient for 4 children.

Savoury Custard

2 eggs 1 teaspoon of meat or yeast extract
 $\frac{1}{2}$ pint of milk
Salt A little butter

Heat the milk, stir in the extract, and leave it to cool. Beat the eggs with salt and add them to the cooled milk mixture. Grease small ovenware dishes with butter, pour in the custard, and bake it gently until it is set—15 to 20 minutes.

Honey Custard

2 eggs $1\frac{1}{2}$ pints of warm milk
 $\frac{1}{4}$ cup of honey

Melt the honey in the warm milk. Beat the eggs and stir them into the milk and honey. Butter a pie dish or small moulds, pour in the custard, and bake it gently for about 30 minutes or until it is set and lightly browned on top.

Bread-crumb Pudding

$\frac{1}{2}$ cup of soft bread-crumbs Salt
2 $\frac{1}{2}$ tablespoons of sugar 3 eggs
1 tablespoon of melted butter 1 pint of milk
1 teaspoon of vanilla essence
Strawberry jam

Soak the breadcrumbs in the milk for $\frac{1}{2}$ hour. Stir in 2 tablespoons of the sugar, the essence, a pinch of salt, and 2 whole eggs and 1 yolk, well beaten. Pour the mixture into a buttered pie dish. Place the dish in a tin containing lin. of hot water and bake the pudding in a moderate oven for 25 minutes or until it is almost set.

Beat the egg white until it is stiff and beat in $\frac{1}{2}$ tablespoon of sugar. Spread the pudding with jam, cover it with the meringue, and bake it for another 5 minutes to brown the top lightly.

A Holder for a Stirring Spoon



[Sparrow Industrial Pictures Ltd. photos.]

WHEN jams, jellies, sauces, custards, and similar foods are being made a stirring spoon is used frequently, and the vexed question arises of where to put it when it is not in use. If it is left in the preserving pan, frequently it has fallen in too far by the time it is wanted again; if it is put on the stove top, it leaves a sticky, hard mass. Now this problem has been solved; A spoon rest which can be set on the side of a saucepan or preserving pan holds the spoon with the bowl over the food. Drips fall back into the saucepan, and the spoon is at hand for the next stirring.

—EVA TOPPING, Rural Sociologist,

Department of Agriculture, Auckland.

Baby's Knitted Frock and Matinee Coat

THE baby's dainty frock and useful matinee coat illustrated are made in 3-ply baby wool, 4oz. of the main colour and 1oz. of a contrasting colour. The garments are knitted on two No. 11 and two No. 9 needles, tension being 7 stitches to the inch. Seven buttons are required.

Measurements of the garments are:—

Frock: Length, 16in.; chest, 18in.; sleeve seam, 1½in.

Coat: Length, 10in.; chest, 19in.; sleeve seam, 6in.

Abbreviations used are: K., knit; p., purl; st., stitches; m.1., make 1; tog., together; sl.1, slip 1; p.s.s.o., pass slipped stitch over; rep., repeat; beg., beginning; cont., continue; st.st., stocking stitch; patt., pattern; g.st., garter stitch; mn., main; c., contrasting; dec., decrease.

FROCK

The Back

With mn. wool and No. 9 needles cast on 115 st. and work 2 rows in g.st. Change to c. wool and work 2 rows in g.st. Rep. these 4 rows once. Change to mn. wool and work 4 rows in st.st. Change to c. wool and work 2 rows in st.st.

Work in patt. thus: First row: K.3, *m.1, sl.1, k.1, p.s.s.o., k.4. Rep. from *, ending k.2 instead of k.4. Second and alternate rows: P. Third row: K.1, k.2 tog., m.1, k.1, m.1, sl.1, k.1, p.s.s.o. Rep. from * to last st., k.1. Fifth row: K.2 tog., * m.1, k.3, m.1, sl.1, k.2 tog., p.s.s.o. Rep. from * to last 5 st., m.1, k.3, m.1, k.2 tog. Sixth row: P. Rep. these 6 rows once more. Work 2 rows in st.st. Change to mn. wool and work 4 rows in st.st. Change to c. wool and work 2 rows in st.st. Change to mn. wool and cont. in st.st. until work measures 11½in., ending with a p. row. Change to No. 11 needles. Next row: *(K.2 tog.) 4 times, k.1. Rep. from * to last 7 st. (k.2 tog.) 3 times, k.1 (64 st.). Next row: K. Change to c. wool and work 2 rows in g.st. Change to mn. wool and work 2 rows in g.st. Change to c. wool and work 2 rows in g.st. Change to mn. wool and No. 9 needles and cont. in st.st. until work measures 12½in.

Shaping the armholes: Cast off 4 st. at beg. of next 2 rows, then dec. 1 st. at both ends of alternate rows until 50 st. remain. Cont. in st.st. until work measures 15½in., ending with a p. row.

Shaping the neck: Next row: K.13, cast off 24, k.13. Cont. in st.st. on last 13 st. for ½in., ending with a p. row. Cast off. Rejoin wool to remaining 13 st. at neck edge and work to match.

Front

Work the front as for the back until the armhole shapings are completed and 50 st. remain. Cont. straight until the work measures 14½in., ending with a p. row.

Shaping the neck: Next row: K.13, cast off 24, k.13. Cont. in st.st. on last 13 st. for ½in., ending with a p. row. Cast off. Rejoin wool to remaining 13 st. and work to match.

Sleeves

With mn. wool and No. 11 needles cast on 36 st. and work 2 rows in g.st. Change to c. wool and work 2 rows in g.st. Rep. these 4 rows once more. Change to mn. wool. Next row: K.1, *k. twice in next st., k.2. Rep. from * to last 2 st., k. twice in next st., k.1 (48 st.). Change to No. 9 needles and cont. in st.st. until work measures 1½in., ending with a k. row.

Shaping the top: Dec. 1 st. at both ends of the next row and every following third row until 34 st. remain. Cast off 4 st. at beg. of next 6 rows. Cast off.



Neck Borders

With No. 11 needles and c. wool and with the right side of the work facing one pick up and k.13 st. down the neck edge of the front, 24 across the front, and 13 st. up the other side of the neck. First row: K. Second row: With mn. wool k.11, sl.1, k.1, p.s.s.o., k.2 tog., k.20, sl.1, k.1, p.s.s.o., k.2 tog., k.11. Third row: With mn. wool k. Fourth row: With c. wool k.10, sl.1, k.1, p.s.s.o., k.2 tog., k.18, sl.1, k.1, p.s.s.o., k.2 tog., k.10. Fifth row: With c. wool k. Sixth row: With mn. wool k.9, sl.1, k.1, p.s.s.o., k.2 tog., k.16, sl.1, k.1, p.s.s.o., k. to last 2 st., k.2 tog. Third row: With c. No. 11 needles and c. wool and the right side of the work facing one pick up and k.5 st. down the neck edge of the back, 24 st. across the back, and 5 st. up the other side of the neck. Work as for the front neck border, but begin and end the second row k.3 instead of k.11. Fourth row: K.2 instead of k.10. Sixth row: K.1 instead of k.9.

MATINEE COAT

With No. 9 needles and mn. wool cast on 157 st. First row: With mn. wool k. Second row: With mn. wool sl.1, k.1, p.s.s.o., k. to last 2st., k.2 tog. Third row: With c. wool k. Fourth row: With c. wool sl.1, k.1, p.s.s.o., k. to last 2 st., k.2 tog. Rep. first and second rows once more, then work 2 rows in g.st. with c. wool. Change to mn. wool and work in patt. as for the frock, repeating the 6 patt. rows until the work measures 6½in., ending with a row on the wrong side. Divide for fronts and back and shape armholes thus: Next row: Patt. 34, cast off 7, patt. 69 including st. already on right-hand needle, cast off 7, patt. to end. Work on the last set of 34 st. for left front, dec. 1 st. at armhole edge in alternate rows until 31 st. remain. Cont. straight until work measures about 7½in., ending with a sixth patt. row.

Decreasing for the yoke: Next row: K.1, *k.2 tog., k.3. Rep. from * to end. Next row: K. Change to c. wool and work 2 rows in g.st. Change to mn. wool and work 2 rows in g.st. Change to c. wool and work 2 rows in g.st. Change to mn. wool and cont. in st.st. until work measures 9in., ending at front edge.

Shaping the neck: Cast off 3 st. at beg. of next row, then dec. 1 st. at neck edge of every row until 17 st. remain. Cont. straight until the work measures 10in., ending with a p. row. Cast off. Rejoin wool to st. for the back with

BABY'S KNITTED FROCK AND MATINEE COAT . . .

the wrong side of the work facing one. Cont. in patt.; dec. 1 st. at both ends of alternate rows until 63 st. remain. Cont. straight in patt. until the work measures about 7½ in., ending with a sixth patt. row.

Decreasing for the yoke: Next row: K.3, *k.2 tog., k.3. Rep. from * to end. Next row: K. Change to c. wool and work 2 rows in g.st. Change to mn. wool and work 2 rows in g.st. Change to c. wool and work 2 rows in g.st. Change to mn. wool and cont. in st.st. until work measures 10 in., ending with a p. row. Cast off. Rejoin wool to st. for right front with the wrong side facing one. Cont. in patt.; dec. 1 st. at armhole edge on alternate rows until 31 st. remain. Cont. straight in patt. until the work measures about 7½ in., ending with a sixth patt. row.

Next row: *K.3, k.2 tog. Rep. from * to the last st., k.1. Complete to match left front.

Sleeves

With No. 11 needles and mn. wool cast on 35 st. and work 2 rows in g.st. Change to c. wool and work 2 rows in g.st. Rep. these 4 rows once more and increase 1 st. at both ends of last row. Change to No. 9 needles and mn. wool and work in patt. as for the coat, increasing 1 st. at both ends of the fifth row and every following sixth row until there are 49 st. Cont. straight in patt. until the sleeve measures 6 in.

Shaping the top: Dec. 1 st. at both ends of alternate rows until 43 st. remain, then dec. 1 st. at both ends of every row until 19 st. remain. Cast off.

Front Borders

With No. 9 needles and c. wool and with the right side of the work facing one pick up and k. 50 st. down left front, beg. at neck edge and ending at the top of the border. First row: K. Second row: With mn. wool k. to the last st., k. twice in last st. Third row: With mn. wool k. Fourth row: With c. wool k. to last st., and k. twice in last st. Fifth row: With c. wool k. Sixth row: With mn. wool k. to last st., k. twice in last st. Seventh row: With mn. wool k. Cast off with mn. wool. With No. 9 needles and c. wool and with the right side of the work facing one pick up and k. 50 st. up right front, beg. at the top of the border and ending at the neck. First row: K. Second row: With mn. wool k. twice in first st., k. to end. Third row: With mn. wool k. Fourth row: With c. wool k. twice in first st., and k. to the end. Fifth row: With c. wool k.8, cast off 2, k.8, cast off 2, and k. to the end. Sixth row: With mn. wool k. twice in first st., k. to the last 16 st. (cast on 2, k.8) twice. Seventh row: With mn. wool k. Cast off with mn. wool.

Neck Border

Join shoulder seams. With No. 11 needles and c. wool and with the right

side of the work facing one pick up and k. 56 st. evenly all round neck. First row: K. Second row: With mn. wool k. Third row: With mn. wool k. Fourth row: With c. wool k.2, cast off 2, and k. to end. Fifth row: With c. wool k. to last st., cast on 2, and k.2. Sixth row: With mn. wool k. Seventh row: With mn. wool k. Cast off with mn. wool.

Making up the Garments

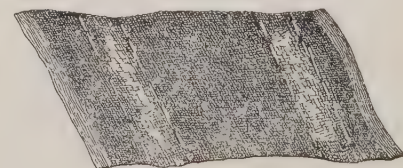
Press the work lightly with a hot iron and damp cloth.

Frock: Join the side and sleeve seams. Join the shoulder seams for about ½ in. at the armhole edges. Work a row of double crochet along the shoulders, making 2 chain buttonloops on each front shoulder. Sew buttons to the back of the shoulders to match the buttonloops. Sew in the sleeves, gathering in fullness at the top.

Coat: Join the sleeve seams. Sew in the sleeves. Join the mitred corners of borders neatly. Sew on buttons to match the buttonholes. Press all the seams.

Uses for Old Towels

TOWELS most often become worn a few inches from the ends. When they have passed the mending stage they may be cut as illustrated in the diagram to make kitchen hand towels and face flannels or dusting mitts.



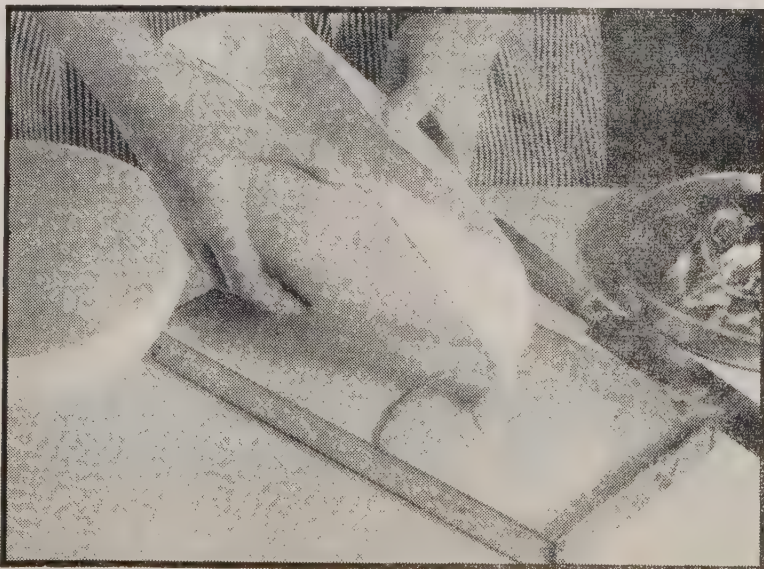
The worn patches are removed by cutting along the dotted lines.

The centre piece can be bound with print or bias binding to match the kitchen colour scheme, and a loop of binding at one corner is useful for hanging up the towel.

The pieces from the ends may be folded in halves and stitched down the sides. When the open end has been hemmed the strips make mitts which may be used to speed up dusting. They also make good polishing cloths for furniture and, if one is worn on each hand, their use cuts down polishing time. Similarly they may be used as polishing-off cloths for window and mirror cleaning or for silver cleaning. If the short pieces of towel are large enough to make face or bath flannels, they can be crocheted or buttonholed or blanket stitched round the edges. If each is done with a different colour, they are most useful for children, as each child can have his or her own colour and will always know which flannel to use.

—NELL MACPHERSON,
Rural Sociologist,
Department of Agriculture,
Auckland.

A Flexible Mixing Bowl Has Advantages



[Sparrow Industrial Pictures Ltd. photo.]

PLASTIC cooking utensils have arrived, and one of the latest is a flexible mixing bowl. These bowls have several advantages: They are light to hold while pouring a batter or sponge mixture into a baking tin; they can easily be bent into a lip for pouring; they are quickly cleaned, as mixtures do not cling to the sides; and scraping is simplified, as the bowl "gives" when a spoon or spatula is passed over it.

—EVA TOPPING, Rural Sociologist,
Department of Agriculture, Auckland.

Milk in the Home Needs Special Care

By ANNA M. CHAPMAN, Rural Sociologist, Department of Agriculture, Dunedin.

MOST people realise the importance of milk in the diet, for, because of the number of nutrients it contains, it is considered to be one of the most nearly complete foods that exist. Milk is the natural food for the young of all mammals and provides all the nutrients necessary for the maintenance of their health and for their growth. But because milk contains so many nutrients, it is practically the perfect breeding ground for the growth of bacteria, some of which are harmless, but several types of which are extremely dangerous. Milk is decomposed by bacteria very rapidly, and if infected with pathogenic (harmful) bacteria, it may prove to be a very dangerous food. For this reason milk has always to be handled with special care.

MILK can never be completely free from bacteria unless it is sterilised, but if the milking is carried out with due regard to cleanliness and hygiene, and if the equipment and receptacles are properly sterilised, it is always possible to obtain milk with a low bacterial content and good keeping qualities. On the other hand careless milking invariably leads to a high bacterial content and rapid souring.



All receptacles and equipment used in milking or for holding milk should always be first rinsed in cold water and then washed and sterilised by boiling water or steam.

Apart from the actual process of milking, it is obvious that there are many other opportunities for the contamination of milk during its handling and distribution. Many bacteria are able to grow rapidly in milk, and with lack of care it is not unusual to find that milk, when it reaches the consumer, contains a large number of germs, especially if the milk has been sold loose in billies or similar containers over a shop counter, or even by the time it is used in the farm house.

A great improvement in the cleanliness of milk has been achieved in recent years as the result of more knowledge of the dangers of contamination and greater care in the collection, transport, and distribution

of milk. Bacteriological tests have contributed to these improvements, because they have shown which are the commonest and most serious sources of contamination. These tests show that unclean utensils such as pails, cans, strainers, and household containers are likely to be the worst sources of contamination particularly when a few drops of stale milk remain in a piece of equipment. Bacteria will grow quickly in these dregs, and if the fluid evaporates, the surface of the bucket or some other piece of equipment may remain coated with bacteria. For this reason all receptacles and equipment used in milking or for holding milk should always be first rinsed in cold water and then washed and sterilised by boiling water or steam.



A source of contamination of milk second in importance to unclean utensils is dirt from the cow. This can be avoided by having clean surroundings and good facilities for washing before the milking begins.

[National Publicity Studios photo.]

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CARE OF MILK IN THE HOME

Second in importance as a source of contamination is dirt from the cow. This can be avoided by having clean surroundings and good facilities for washing before the milking begins.

As a rule the milker or stripper himself contributes fewer bacteria than the cow, but the washing of his hands naturally makes for cleaner milk. Dust in the air also contributes a certain number of bacteria to the milk, though this is a less important source of contamination.

Clean milk, that is milk with a low bacterial content, cannot be assumed to be safe to drink unless it has been pasteurised or unless the herd is known to be completely free from disease. The milk within the udder of a healthy cow is sterile, but cows suffering from bacterial infections may excrete pathogenic bacteria with the milk. This is most likely to happen with diseases which affect the udder itself; in fact, milk from a cow with a bacterial disease of the udder may be heavily infected with pathogenic bacteria. Examples of such diseases are tuberculosis, mastitis, and *Brucella abortus* infections. This last causes contagious abortion in cows and undulant fever in humans. All these bacteria are killed by pasteurisation; therefore it is very important when buying milk always to be sure it is pasteurised. Particularly is this so for people on a town supply who do not know the source of the milk.

There are two methods of pasteurisation, and the second of these can and should be applied in the home if only raw milk is available and the source of supply is unknown, or even on the farm if there is any doubt as to the health of a cow.

The first method of pasteurisation, not very simple for the housewife to carry out, is the retarder or holder method. This consists of raising the milk to a temperature of 145 degrees to 150 degrees F., holding it at this temperature for at least 30 minutes, and then cooling it immediately to 55 degrees F. or lower.

The second method, which the housewife can carry out easily if she has a thermometer, consists of rapidly heating milk to a temperature of 160 degrees to 165 degrees F. and holding it there for 10 to 20 seconds only before cooling it again rapidly. This is known as the "high-temperature short-time pasteurisation process". It saves time and when pasteurisation is being carried out on large quantities of milk—for example, in a milk treatment station—it requires simpler equipment than the holder or retarder process.

Neither of these methods of treating milk alters its flavour nor reduces the amount of cream which will separate from it when it is left to stand. If pasteurising milk at home, do not guess at the temperature but use a thermometer, and to prevent a skin from forming stir the milk frequently while it is heating, and while it is cooling. It is most important to cool it quickly. Standing the container in a bowl into which the cold tap is running is as good a way as any.

Pasteurisation kills all pathogenic bacteria in milk. Economically, pasteurised milk has a great advantage over raw milk, because the bacteria causing the milk to go sour are killed during pasteurisation, and therefore the



[National Publicity Studios photo.]

If a billy is used for collecting or storing milk, it should be one stamped from a single piece of metal if possible, and should not have a seam round the bottom.

keeping qualities of the milk are prolonged. At present pasteurisation of milk constitutes the best safeguard against milk-borne disease.

Storage of Milk

Pasteurised or clean, safe, raw milk will deteriorate, however, if it is not stored under the correct conditions.

Milk will readily absorb odours from strongly flavoured foods if it is stored in an uncovered vessel above them in a safe or refrigerator, and it will be found that the flavour of the milk is greatly altered.

If proper care is not taken, milk is as readily contaminated by bacteria during storage as at any other time. This is, of course, true for pasteurised as well as unpasteurised milk. Bacteria from dust and air will get into it very easily, and these will multiply rapidly, especially if the milk is kept in a warm room. Hence it is especially important to store pasteurised and unpasteurised milk carefully in a sterile container with a well-fitting lid until just before use. If a person with an infection, for example, a cold or influenza, is handling uncovered milk, bacteria are liable to get into it, multiply, and thus spread the infection to the rest of the family.

Always keep milk covered from flies. Flies are one of the most efficient spreaders of infection and disease, yet many people leave an uncovered jug of milk on a table or bench, regardless of flies swarming round it and over it.

There is often a considerable loss in the nutritive value of milk because of incorrect storage. Vitamin C as it is found in milk is readily destroyed by contact with the air; therefore, if the milk is left in the sun, which speeds up the destruction, or in an uncovered receptacle, a large proportion of the vitamin C is lost.

Milk should be stored in a clean, covered receptacle in a cool, dark place. By a clean receptacle is meant one which has been rinsed in cold water as soon as the milk has been

tipped out of it and then scalded with boiling water and left to drain. It should not be dried with a tea towel, as this may hold bacteria and leave them on the jug or billy. It is necessary to rinse the container with cold water first, because when milk comes in direct contact with heat some of the protein it contains coagulates and forms a skin which is very difficult to remove from the container.

If a billy is used for collecting or storing milk, it, if possible, should be one stamped from a single sheet of metal and should not have a seam round the bottom. Bacteria quickly collect in the seams of milk billys and buckets and are very difficult to remove. These utensils should, of course, be rinsed and scalded after every use. Whenever possible buy milk in sealed bottles.

Milk when it has been delivered should not be left at the gate in the sun. A box facing away from the sun should be provided for it, as sunlight produces peculiar flavours.

When using bottled milk the caps of the bottles should always be washed before they are removed, as there will be dust and germs on them which if they are not wiped off can easily get into the milk. The milk should be stored in the original bottle with the cap on until immediately before use, or with a clean inverted tumbler over it if some milk has been taken from the bottle. This keeps it away from flies, dust, and odours, and, of course, from bacteria.

Bottled milk for table use should be poured into clean, sterilised jugs and should not be poured back into the bottle after being in a jug. Similarly a jug of home-pasteurised milk which has been partly used at the table should not be poured back into the main store of milk, but should be kept separately and used up first.

If it is impossible to procure bottled, pasteurised milk, pasteurise it at home for safety from disease-producing germs, and store it in sterilised, covered containers

Small Bag Made from Handkerchiefs

By NORMA K. METSON, Rural Sociologist, Department of Agriculture, Wellington.

GIFTS sometimes include specially attractive silk or chiffon handkerchiefs, and over the years several may collect in a drawer and are seldom used except to tuck in a suit pocket. Such pretty colours and designs deserve a better fate than continued obscurity. Two handkerchiefs of the same size which match or contrast pleasantly will make the small bag illustrated, which may be used to hold tating, crochet, or a piece of fine needlework or lipstick, powder puff, and comb to take to an evening party.

CUT a circle about 5½ in. in diameter from the centre of one handkerchief and finish the cut edge with a tiny rolled hem (being careful not to



Small bag (closed) made from two handkerchiefs, with powder puff, comb, and handkerchief, which would be the type of articles it would contain when it is used as an evening bag.

stretch it while sewing) or with a binding cut from matching net or made by cutting and joining 5 bias strips from the centre circle.

Spread out the uncut handkerchief right side up and place the cut one (also right side up) diagonally over it so that an 8-pointed star is formed. Join the two pieces together where the edges overlap, first tacking them and then using small over-sewing hand stitches in matching silk. Machining is likely to drag threads in a very fine material, but a sturdier fabric can be machine stitched provided needle, thread, and stitch are all fine.

Draw-strings

The bag is closed with a double draw-string, which may be inserted in various ways. If the opening has been finished with a flat binding, run a line of stitching ¼ in. in from the edge to form a heading. The cords are then threaded through, emerging from 2 small buttonholes worked in the upper

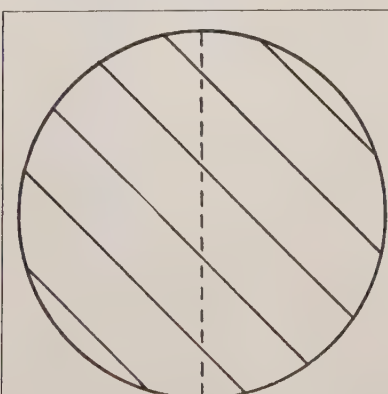
surface at each side. The buttonholes should be cut on the straight grain and worked before the circle is cut out. Slots could be worked at ¼ in. intervals right round about ¼ in. from the edge and the draw-strings threaded through them. Matching lace insertion or ribbon made with slots especially for threading would form a very attractive edging, as would a fine crochet border in a matching colour.

For draw-strings use fine cord, braid, silk shoe laces, plaited strands of embroidery silk or cotton, or a crocheted chain made with double thread. Two pieces each 20 or 21 in. long will be required. Thread them round in opposite directions, so that the ends come out directly opposite each other, and join the ends of each by tying and knotting them together. The bag can then be closed by pulling the draw-strings at each side.

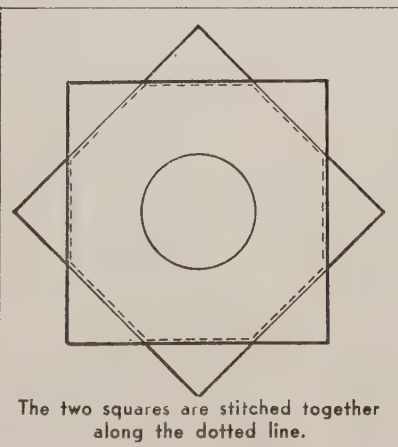
Use of Alternative Materials

This method of making handkerchief bags could be modified. Scraps from an evening frock could be used for a matching bag; two 12 in. squares of gold or silver lamé, brocade, or silk velvet sprinkled with sequins will make one to be used with any party frock. For these the edges of the squares will have to be finished also; for fine materials picot edging is suitable.

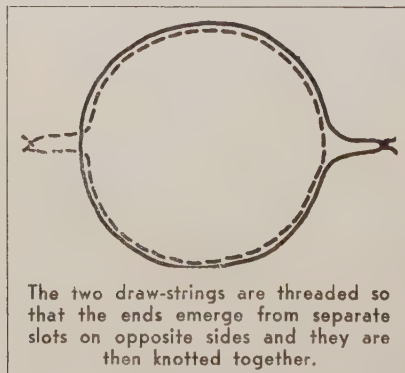
Larger squares of sturdy material such as crease-resisting linen or cotton pique will make bags for use as summer purses or small sewing bags. These bags are surprisingly roomy and the draw-string fastening is neat and easily operated, leaving convenient loops for carrying the bag or hanging it up.



Binding strips cut on true bias; dotted line indicates the straight grain.



The two squares are stitched together along the dotted line.



The two draw-strings are threaded so that the ends emerge from separate slots on opposite sides and they are then knotted together.

Field Survey of Housing in Vincent County

COMPARISON OF LABOUR REQUIREMENTS

THAT housewives are among the hardest-worked people in the community under present conditions in New Zealand is widely recognised. There has been no lightening of their labours comparable to the effects of the 40-hour week for people who work away from the home. Among housewives, the mother with young children and the farmer's wife carry the heaviest burdens of work, and one of the factors which has an important influence on the amount of labour required of the home maker is the house in which she has to work. In this, the second of three articles by Edith G. McNab, Rural Sociologist, Department of Agriculture, Timaru, based on a field survey of housing in Vincent County, houses are compared on the basis of the amount of labour required to run them.



The younger generation of housewives has had opportunities to learn more about house planning than have older women. That may be one reason why the survey on which this series of articles is based showed that the homes of the younger housewives in Vincent County were more likely to have low labour requirements.

RESULTS of such a comparison might be expected to give a guide to the importance of this aspect of housing on women's work and to what information housewives need to help them overcome inadequacies or poor arrangements. Little literature was available to help in working out a scale for measuring the labour requirement of a house, but the attempt was made, with what advice and assistance it was possible to obtain from housewives and home scientists in the time available. The resulting scale is clumsy and allows too much room for subjective judgments; further trials would be needed before it could be used as a reliable tool in a larger survey.

Basis of Scale

In the construction of the scale the work of the house was classified under provision of meals (storing foods and preparing, cooking, serving, and clearing away meals), housework, and laundry work. Then all the parts of the house affecting these three types of work were considered, together with the fixed equipment available in each part. These parts of the house and groups of facilities were listed as follows: Kitchen; plan of the house; water supply; wash-house or laundry; methods of heating and lighting; facilities affecting the cleanliness of the house, such as sheltered entrances, paved paths, and places for men to wash before meals and to leave working clothes and boots; storage for clothes, cleaning equipment, books, games and sports equipment, ironing and sewing materials, and other items (food storage was considered under kitchen); bathroom; and toilet.

Each of the aspects of the house affecting the work was taken separately and five types were defined,

varying from the ideal, which would require least work, to the type calling for the greatest amount of labour to achieve the same results. For example, the ideal kitchen requiring the least possible amount of work for provision of meals was described as follows: One door to the kitchen, obviating traffic through the room; work centres suitable in size for a family house and arranged in the sequence in which the work of providing meals is done—storage, preparation, cooking, serving, and clearing; good ventilation and lighting; all installations well made and floor, wall, and bench finishes in perfect order to facilitate cleaning; the room a suitable size for its function, either as a working kitchen only or as a kitchen-dining room or kitchen-living room; cooking facilities either an enamelled coal range, an electric stove, or a heat-storage range; sink bench of stainless metal or terrazzo; and all storage for food and utensils built in and arranged to eliminate needless walking, bending, reaching, and moving of articles.

Then the average kitchen was defined, drawing on personal knowledge of South Island kitchens, and after that the kind of kitchen requiring the greatest imaginable amount of work, such as one with cross-traffic of people not concerned in meal preparation; involving much unnecessary walking; either much too large or very cramped; with wall, floor, and bench finishes in bad order and difficult to clean; with an inefficient model of stove requiring black-leading; and lacking sink and built-in storage space. Next, two intermediate groups between these three were defined, giving five groups in all. Whenever possible the five groups for each aspect were arranged so that, starting from the group requiring least work, equal increments of work required

separated each group from the next. If that could not be arranged in the definitions, account was taken of it in allotting the scores for the groups.

Some of the aspects listed affect the work of the housewife more than others. No figures are available for New Zealand showing the proportions of the average housewife's time spent on work in connection with meals, on laundry, and on housework. Studies of the time spent on different tasks by rural housewives in the United States of America show an average distribution to be 60 per cent. on meals, 26 per cent. on housework, and 14 per cent. on laundry work. (Total time was calculated for housekeeping and does not include care of children, sewing, mending, and gardening.) These figures were used to check the common-sense allocation of scores for the different aspects and good agreement was found. In effect, the more important aspects were given a heavier weight in their scores, the order of importance being as in the list of aspects, with some neighbouring aspects treated as of equal importance.

Therefore each kitchen of the houses for which information was available was placed in its appropriate group and given the weighted score of that group; then the plan for each house was placed in the best-fitting group of the five definitions for plans; and so on right through the list. The total score was the sum of the nine scores, one for each of the aspects. In all, 104 houses were rated for the amount of labour required to run them.

Effect of Age of House

When the results were compared the effects of several factors could be seen. In general, the most important factor influencing the score was the age of

LABOUR REQUIREMENTS OF HOUSES . . .

the house. That is not to say that the housewife's work is made equally easy in all houses being built today; the scores for the group of houses up to 15 years old showed that, though most of them were better than the average for the county, some were in the worst groups requiring very high amounts of labour. Nor does an old house necessarily require much work; some of the old houses were well planned and need only the bringing of their equipment up to date to be as easy to work as many new ones. However, the following table illustrates the broad statement that the older the house the more labour it requires:—

Age of house (years)	Number of houses	*Number easier to work than average	*Percentage easier to work than average
Up to 19	.. 28	20	71
20 to 39	.. 24	13	54
40 to 59	.. 18	6	33
60 and older	.. 30	5	17

* The average is the mean labour requirement score for the 104 houses. As a good estimate of the ages of 4 houses was not possible, the total number classified according to age is 100.

The income level is also an influence, but the houses of well-to-do people are not always the easiest in which to work. Money spent ill-advisedly on a house may increase the labour required. No particulars of income were sought from the housewives visited, so nothing further can be deduced about its effect on the labour requirements of houses.

Though the effects of age and income cannot be disentangled, it seems probable that the general standard of what was acceptable in a house at the time of building is one of the basic influences on how much labour is required. The moral is not to accept the prevailing or fashionable ideas on house planning too readily, but to examine each idea to see whether it will function well.

In the houses of the older age groups the labour-requirement score was much affected by additions and alterations. In some houses alterations had been made with poor judgment, and other people who had spent much less money but had planned well had ended with more easily worked houses.

Attention to Design

The distribution of the scores in the group of houses up to 15 years old was most interesting when related to who built them. (This sort of information is not always easily available for older houses, which may have changed hands.) Of the fifteen best houses in this group two were planned and erected by builders for their own families, twelve were built for their present owners, who all had decided ideas on what they wanted and had spent some time thinking out what was best for their own family circumstances, and one was erected with no cost spared. A house which has been designed thoughtfully certainly pays dividends in reducing the labour needed when living in it.

The three houses requiring the greatest amount of work in this age

group had been built by joining together two or more huts. Ingenuity can overcome lack of money to a considerable extent, and not all houses made by joining huts together had high labour requirements. A few more minutes spent in planning even a temporary dwelling can save the housewife many hours of work. Knowledge of planning, some imagination, and forethought can make the money available go much further in providing comfort and convenience than it would do otherwise. Some houses among those requiring least work grew from very small beginnings, the owners doing their own planning and much of the construction themselves.

Age of Housewives

The houses of the younger housewives as a group were more likely to have low labour requirements. One reason probably was that more of this group of women lived in the newer houses and the older houses occupied by members of this group had been more recently renovated. Perhaps the younger women had had opportunities to learn more about house planning than had most of the older women.

It was noticeable that many women who had heavy labour loads because of other causes than the kind of house they lived in had, by well-thought-out alterations or additions, reduced the work needed by the house. The younger women who had children to care for required more time for the care of the family and had a strong motive for decreasing the time needed for housekeeping. Older housewives with very small households had less incentive to think of ways of reducing the labour requirements of their houses. Many older people had lower incomes than they enjoyed when in their prime, and there is less likelihood of changes being considered worth while.

Length of Occupation

No evidence suggested that the labour requirement decreased with length of residence in a house. Any alterations tended to be made when the house was first taken over; there must be a tendency for people's ideas on what is convenient to become fixed, and once this standard is attained few changes are made. Yet adapting the house to changing family and external circumstances and to the use of new equipment must be worth while.

Jellies Made in Half an Hour

HERE are some points in making gelatine desserts set as quickly as possible in hot weather.

Use a little more gelatine than usual. If the recipe says 1 level spoonful, use a heaped one and soak the gelatine in cold water for a few minutes.

Dissolve the gelatine in the smallest possible amount of boiling water and make up the rest of the liquid content with cold water. Water chilled in a refrigerator is a great help toward quick setting, as are cold stored fruit juices, which add flavour as well.

Some houses designed to be worked with the assistance of a maid remain unaltered though the housewife has run it by herself for years. When changes take place gradually over the years they may pass almost unnoticed, so it is a good practice occasionally to consider whether the old arrangements are still the best. Some mental and physical energy is needed to make changes, but the effort may be well repaid by the time and energy saved in later operations.

Houses in the boroughs tended, though not very pronouncedly, to be better than those in the country. One cause is that there has been more building in the boroughs of recent years, and also it is probable that access to knowledge of developments in building and planning is easier in the boroughs.

Types of Farming and Occupations

Differences between the houses when classified according to the type of farming or the occupation of the owner were not great. There appeared to be some tendency for houses on fruit farms to require less labour than others; work efficiency in a house is particularly important in the picking season, when the housewife may assist in the packing shed as well as providing meals for extra people and caring for her family as usual.

The other group of houses showing greater differences from the rest was that of retired people and widows; their houses, on the whole, tended to have higher labour requirements.

Houses occupied by the owners were much better, on the average, than houses which were rented or belonged to employers. The disadvantages of a house often are not realised by a person who does not live in it. This problem of suitable housing is one of great significance to farmers who are interested in obtaining permanent labour. With many kinds of work from which to choose, people will not work on farms unless they can live at a reasonable standard of comfort and convenience.

More of the time for relaxation and recreation is likely to be spent in the home in the country than in towns; less work can be sent outside the house to be done, and fewer things can be bought instead of made; and country housewives have a greater variety of tasks to do than their town sisters; consequently satisfactory housing is all the more important.

Place the jelly mould covered with a muslin cloth in cold water so that the cloth just dips into the water.

As a jelly cools from the outside toward the centre, it is an advantage to set it in several small moulds rather than one large one.

When on a hot summer's day the dinner preparations are under way and a pudding has still to be conjured up, remember these points and do not cut jellies off the list of possibilities. They can be made in half an hour.

—HELEN PAINE,
Rural Sociologist, Department
of Agriculture, Wellington.

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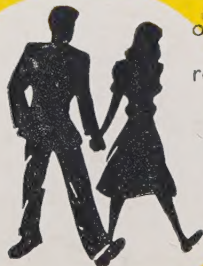


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